The Electrical Industry's Weekly Magazine

April 9, 1956

Electrical World

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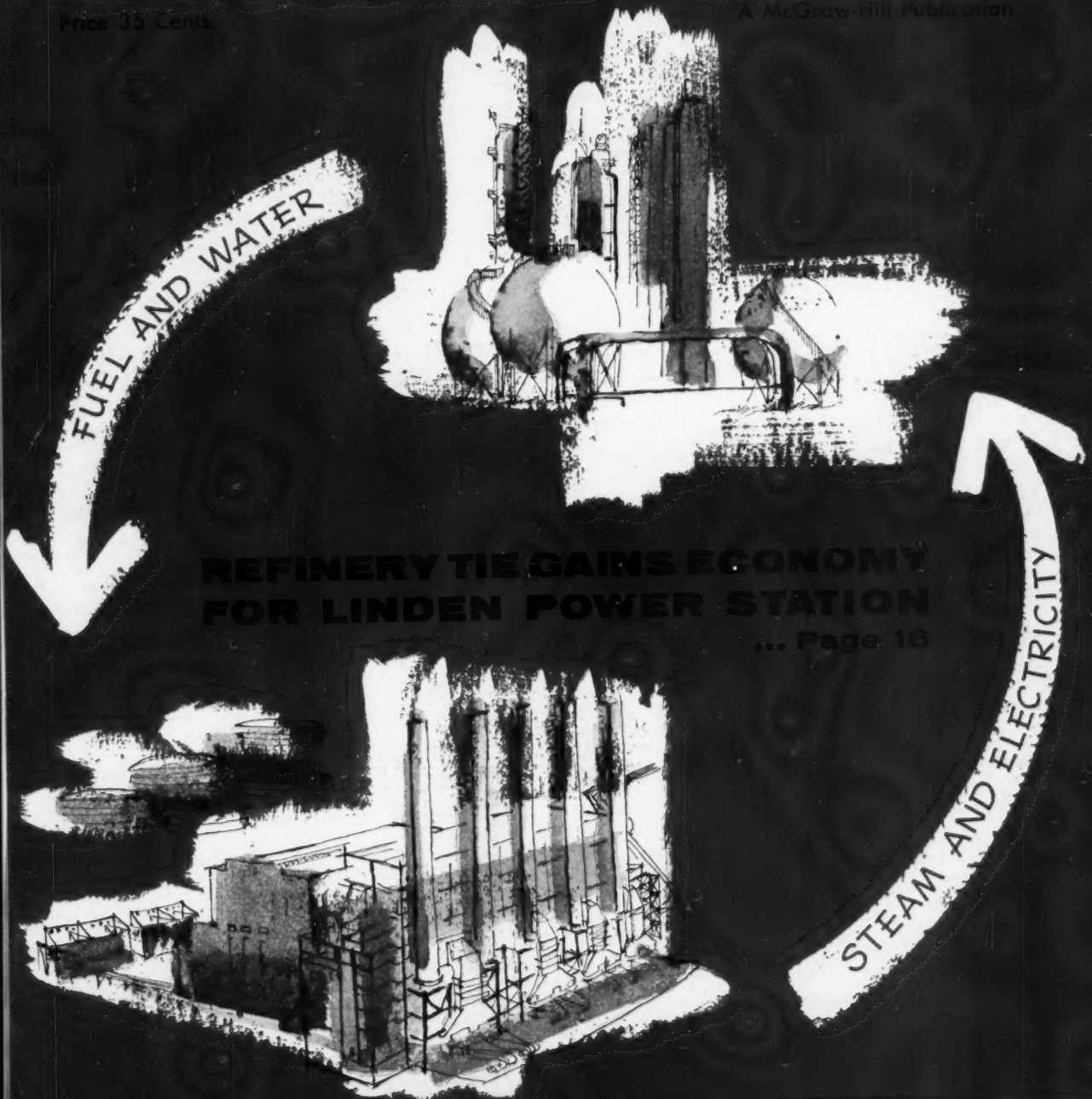

REFINERY TIE GAINS ECONOMY FOR LINDEN POWER STATION

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MANUFACTURERS AND MARKETS

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E B POWER
UNIVERSITY MICROFILMS
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ANN ARBOR MICH

IN PROMOTING INDUSTRIES in its service area, Mississippi Power & Light used window displays of locally-manufactured goods to demonstrate the positive economic significance of electric power to the community.

C.E.I. AGGRESSIVELY PROMOTED OPPORTUNITY offered by St. Lawrence Seaway. Utility showed area's growth potential with power station tours (above), and an "Automation Capital of U.S." program for Cleveland.

MPA Awards spark utility reappraisal of power sales, area development planning

What are the industrial load potentials in your electric utility's service area? And how can you best capitalize on them? These are questions utility men are asking themselves, stimulated by the 1955 More Power to America Awards presented to Mississippi Power & Light and The Cleveland Electric Illuminating Company.

The MPA Award, made each year to electric utilities showing outstanding industrial sales activities, covers a broad range, including Productivity Forums and MPA programs to allied industry, and customer consultation and mailing services. Each year, the Award offers utilities an outstanding opportunity to take a new look at industrial load growth potentials . . . and what's being done about them.

A positive approach to new industrial business for your utility may add up to a positive answer to the question: Are you in line for the MPA Award? For full details, contact your G-E Apparatus Sales Representative. Or write to the General Electric Company, Section 301-328, Schenectady 5, N. Y.

MORE POWER TO AMERICA

GENERAL ELECTRIC

NEW LOAD-BUILDING TECHNIQUES start at high-level meetings. The Cleveland Electric Illuminating Co. and Mississippi Power & Light directed their sales forces to meet the challenge of individual load opportunities.

ALLIED INDUSTRIES including contractors and builders were briefed on C.E.I.'s marketing plans. Utility co-operated to the fullest extent with allies in sponsorship of sales meetings aimed at all potential customer groups.

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Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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• • •

COMING NEXT WEEK—EW's financial editor will take our readers down the "rocky" road which utilities must follow to raise funds.

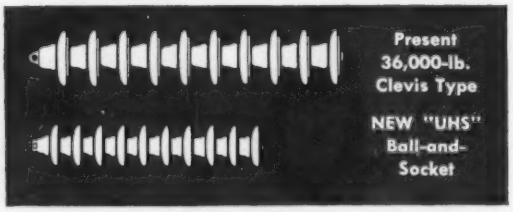
New UHS Ball and Socket Suspension Insulator

Combines close coupling and ultra-high strength with small size—ideal for bundled conductor applications

Never before has such an amazing combination of high mechanical and electrical strength been concentrated in so small an insulator. The unique strength and compactness of "UHS" (Ultra-High Strength) suspension insulators permit economies in transmission line design which should prove most valuable to the utility industry.

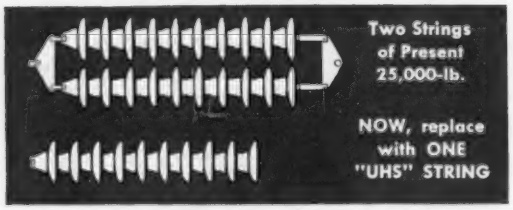
Greater weight-carrying capacity. Shorter strings. Elimination of need for double-string dead-ends. Shorter towers for ultra-high voltage lines. Light weight and simple handling reduce labor costs. All these are now within reach with the new Locke "UHS" insulator.

Look over the facts below. Picture how this development can affect your system. For further details, see our representative nearest you.



5¾-INCH SPACING

Provides higher flashover per unit string length than present standard 36,000-lb. clevis type insulator, the unit with the nearest comparable strength rating. Even with reduced diameter, effective leakage distance is increased in a given string length.



ULTRA-HIGH M&E, IMPACT STRENGTH

In use with bundled conductors, each conductor of the bundle may now be dead-ended on a single "UHS" string. Strength permits use of one "UHS" string to replace two 25,000-lb. strings on dead-end installations, effecting substantial hardware and labor savings. High impact strength and the handling of fewer units minimize breakage loss.

10-INCH DIAMETER, 15½ LBS.

16% smaller and 35% lighter than the A.S.A. Standard 36,000-lb. insulator. Less storage space, more efficient trucking, easier handling.

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GENERAL ELECTRIC COMPANY
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EDITORIALS

Who Will Carry the Ball?

Leadership in distribution design to serve all-electric homes must come from utilities which promote them. They alone are connecting enough high usage homes to benefit today from research. They alone have immediate incentive to explore the economic relationships of this new area and to apply new design principles.

A recent round of the "service voltage battle" at the American Power Conference revealed clearly the varied patterns of interest. For the first time, the difference between the combination company and the electric company stood out. The subject was higher secondary voltage.

One Texas utility engineer said:

"It is very timely that utility engineers and equipment manufacturers jointly study the problem and arrive at a standard . . . that will provide a maximum of economy consistent with good operation."

Another advocate of higher distribution voltage urged that utilities in the South and Southwest start promptly to build experimental installations.

Contrasting sharply with these views was a discussion submitted by a utility executive from the Northeast. These quotations from his remarks throw the division of interest into clear focus:

"The combination utility believes fundamentally that gas should be used for fixed heating devices and power, portable heating devices, and usually for air conditioning. In our company average residential consumption was 1,865 kwhr in 1955 with a peak demand . . . of 0.8 kva. This is compared with 1955 average for all utilities of 2,700 kwhr.

"Since large heating devices are supplied by gas, the consumer [would] seldom save any appreciable wiring cost by accepting 460-v 3-phase service. About the only utilization equipment in a gas-electric home [which] could be supplied direct would be house air conditioning. There is slight advantage to the electric utility in 460-v, 3-phase distribution when average residential demands reach 2.5 kva. Since such loads are 15 or 16 years in the future for our company, we do not feel justified in giving it serious consideration at this time."

Engineers from several other combination utilities expressed generally similar views. These utilities find their residential loads still within the range of distribution designed according to forward-looking practices established 20 years ago.

Such differences of opinion are not unusual in early engineering consideration of new proposals. But in this case they reveal that combination utilities, which have contributed their fair share to progressive engineering, lack the incentive to explore distribution economy for heavy residential usage.

Whether higher service voltage is the key to economy in future distribution remains a debatable subject. But it is increasingly clear that spiralling residential loads demand prompt analysis and engineering solutions uninhibited by practices developed for past usage. Leadership in the quest for economy in serving all-electric homes must come from utilities which promote them.

Action Speaks Louder . . .

This is a crucial week for Tennessee Valley Authority's future power financing plans. The Senate Appropriations Committee begins consideration today of a proposal to lessen Congressional authority over further expansion of TVA power facilities.

As we wrote on this page last week, TVA proposes to use its power revenues to finance additional units for its giant steam stations. The starter was $3.5 million set aside for the fourth unit at the John Sevier Station. The House has approved this proposal in language sufficiently broad to permit a vast expansion of TVA power facilities without specific Congressional authorization.

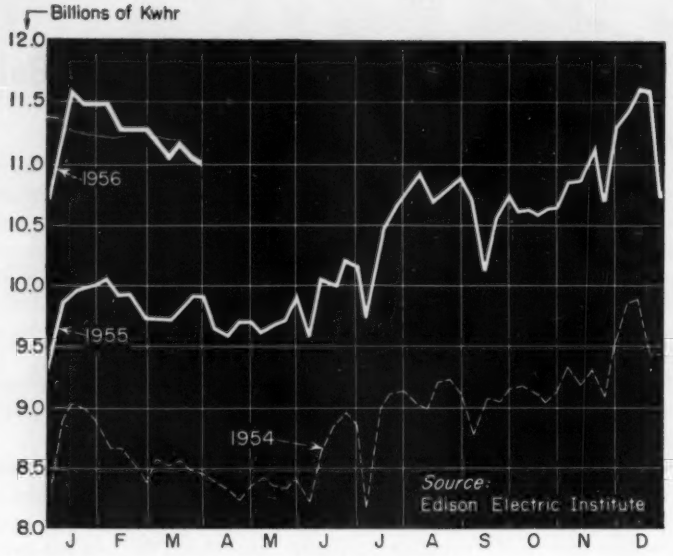
TVA, evidently anticipating favorable action by Congress, has in effect already authorized such expansion. In total it would include an additional 1.1 million kw at present steam stations and cost an estimated $178 million. This would be financed from power revenues. Unless the Senate disapproves the pending appropriation bill, no further Congressional authorization would be needed for this major expansion.

This matter is now before the Senate Appropriations Committee. There is an inclination on the part of some committee members to approve use of power revenues at John Sevier but recommend that such action not be considered a precedent for further expansion without Congressional approval.

This would mean that the committee would be setting a precedent while arguing loudly that it was not a precedent. It is another case where action would speak louder than words.

ELECTRICAL WEEK

LAST MINUTE



OUTPUT

Week ended Mar. 31
10,992,000,000 Kwhr
Up 12.1%

Atomic Energy Commission requirements — 1,125,000,000 kwhr (Electrical World estimate). Excluding AEC output increases was 8.5%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Mar. 31	+12.1	+11.3	+8.2	+17.7	+8.9	+11.2	+12.6	+8.5	+13.2	+8.6
Mar. 24	+12.4	+7.6	+7.1	+18.8	+7.1	+15.2	+9.3	+6.4	+12.8	+7.5
Mar. 17	+14.1	+11.9	+10.8	+20.1	+11.5	+13.8	+10.0	+12.0	+16.4	+9.6

Seasonally Adjusted Index 213.9 Week Ago 217.7 Year Ago 191.0

Issue's Highlights—Roanoke Rapids dedication closes stormy chapter in public versus private power fight history . . . U. S. Comptroller General warns TVA expansion with power funds can be controlled only if Congress amends law . . . Reclamation Bureau forces alerted to start Upper Colorado Project as bill goes to President for signature . . . Westinghouse steps up strike recovery plans; proposes to sell year's quota of consumer goods in remainder of 1956.

The Kilowatts Are Coming—GE reports order backlog of steam turbine generator units totaling over 19 million kw in capacity for shipment as far ahead as 1959. According to W. E. Saupe, general manager of company's Large Steam Turbine Department, shipments this year will total 47 units of 5.2 million kw. But department expects its biggest year in 1957 with 71 units totaling 7.9-million kw scheduled for shipment. Production schedules are complete for first four months of 1958 with orders totaling 4.9 million kw. Some companies are placing orders for 1959 delivery and some already are considering purchases for 1960 and 1961 delivery, Saupe said.

One Bidder—Bureau of Reclamation received something of a slap in the face in calling for bids on triple rated 30-40-500,000-kva 110-kv transformer for Grand Forks Dam. The March 27 deadline yielded only one bid: Legnano Co of Italy. Bureau has rejected the bid because there were no domestic bidders and has called for new bids by April 19.

House Heating Promotion—NEMA has announced a sound-slide color film on electric house heating for consumer showings. Film sells at pre-release price of $12.50. Order forms are being sent to utilities this week.

Aluminum for Copper—Citing high price of copper, Pacific G&E plans to install 145 mi of aluminum transmission cable as replacement for existing copper lines. Cost of new 220-kv installation will be $3 million.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire—Senate Interstate Commerce Subcommittee will start hearings April 17 on bill (S2643) to permit operating utilities to hold equity in joint generating corporation without registering as holding companies . . . Move is afoot in Senate Appropriations Committee to limit TVA's use of power revenues for expansion to additional unit for John Sevier plant. Further additions (and TVA has earmarked six for financing in this manner) would have to be cleared by Congress (See p 9 for earlier details).

AEC has contracted with City of Holyoke, Mass., and Village of Ilion, N. Y., for sale of up to 10,000 kw of 3-mill interruptible power from the submarine test reactor at West Milton, N. Y. Towns have until May 1 to complete arrangement for receipt of power which has been going to Niagara Mohawk Power in interim. Holyoke recently applied to AEC for aid to build demonstration power reactor of its own.

Consumers Power Expands—Pres Dan E. Karn of Consumers Power last week told New York Security Analysts company plans over half-billion dollar expansion to add 1-million kw of new capacity between now and 1960. This is in addition to construction now under way. He also predicts $100 million increase in annual operating revenues in same period. He anticipates earnings this year of about $3.25 a share compared with $3.09 a share in 1955.

Atomic Insurance—American insurance companies are negotiating with Lloyds of London and others operating in world market in effort to increase capacity of three separate pools now being organized to provide coverage for reactor installations in U. S. This was disclosed last week by A. B. Kelly of Associated Factory Mutual Insurance Co's to Houston Area Insurance Buyers Association meeting.

Pacific Northwest—Washington WP and IBEW have signed new wage contract providing 15¢ an hour wage increase for journeymen linemen . . . Sandy, Ore., Electric Co-op directors have recommended to members they accept another co-op's offer to buy their system instead of the offer from Portland GE. Co-op's offer is about $3,000 higher than PGE's.

ABOUT PEOPLE IN THE INDUSTRY

Cowlitz County (Wash.) PUD has brought condemnation suit against Pacific P&L's Yale and Merwin hydro dams on Lewis River. John Dierdorff, PP&L vice president, said "We have been told this is not to be regarded as an unfriendly action, but represents legal move to protect PUD while discussions are underway regarding district's possible participation in share of power from our new Swift Project."

Increasing volume of orders for heavy electrical apparatus was cited by Westinghouse Chairman and Pres Gwilym A. Price to annual stockholders meeting among reasons for confidence in future. New orders in 1955 were 12% above 1954 "and in first two months of 1956 continued at an exceptionally high level. Large share of these new orders is in field of heavy electrical apparatus . . .," Price noted.

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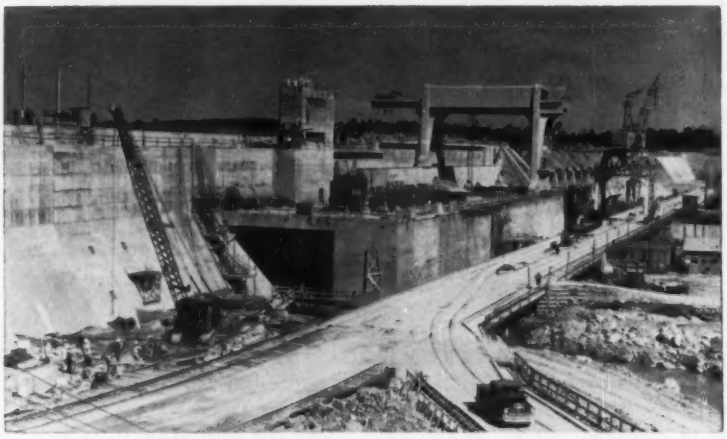
GRANITE EXCAVATION, 72 FT DEEP, IS SITE OF POWERHOUSE



TRANSFORMERS ARE INSTALLED AS PROJECT NEARS COMPLETION

AERIAL VIEW SHOWS POWER STATION, 3,050-FT CONCRETE DAM

Stormy Trail

Public-vs-private power battle centered around Vepco's 100,-000-kw project which was ruled on by Supreme Court

Virginia Electric & Power Co's 100,000-kw Roanoke Rapids hydroelectric project in North Carolina was dedicated last Wednesday.

That fact doesn't sound impressive, particularly in an age when steam-electric plants are boasting capacities of more than 1-million kw. Nor is its $32-million overall cost a huge outlay today.

But these are only the bare-bones facts. They do not reveal the stormy history of this addition to a utility system supplying what was a few years ago a lazy rural area, dependent primarily on farming and fishing. They do not tell the story of the years of political bickering, of litigation which led to the construction of this relatively small dam in time to meet a war-born demand for power in an area gone suddenly industrial.

Politics Snafu Long-range Plans

Vepco built the dam a few miles downstream from the government's huge John H. Kerr development. It's a 3,050-foot-long structure, walling in 4,900 acres of water, and it contains 300,000 tons of crushed stone, 800,000 bags of cement, and 120,000 tons of sand.

Vepco bought the land for the project more than 30 years ago, acquiring it from its predecessor in the area, Roanoke Rapids Power Co. Plans were underway when the 1929 financial crash shelved them. The ensuing depression and wartime materials shortages prolonged the delay until, in 1948, the company felt the time had come to start the ball rolling.

The company applied for, and in 1951 received, a Federal Power Commission license to build the project.

A political battle resulted. It began when then-Secretary of Interior Oscar Chapman appealed the FPC decision on grounds that Congress, in the 1944 Flood Control Act, had approved an 11-dam plan for federal development of the Roanoke River, including one at Roanoke Rapids, even though the legislators had appropriated money for

Ends With Roanoke Rapids Dedication

only two dams, at Buggs Island and Philpot. His contention: FPC had no right to grant a license because the government had reserved the entire Roanoke River basin for future development.

Chapman lost when the First Circuit Court of Appeals unanimously upheld FPC. The court ruled the Secretary of Interior has "no more duty or responsibility in this connection than has the Postmaster General" until the government actually starts construction of a power project.

Chapman appealed to the Supreme Court, and it, too, on March 16, 1953, upheld FPC.

A few months later, actual construction began. It took two years and nine months to finish the dam, which started producing power in mid 1955. The dam is not large—it rises only 72 ft from the river bed—but its construction was a chore. The powerhouse site, for instance, had to be blasted out of solid granite—a 70x230-ft excavation with a 72-ft depth. The four 25,000-kw generators replace an old canal and station that produced only 5,000 kw.

Absent at the April 4 dedication ceremony was the late Jack G. Holtzclaw, president of Vepco for 26 years, who fought for his company's right to build the dam for many years. He died last Dec. 31, just as the project reached completion.

At the dam, Vepco has a plaque, which reads: "In memory of Jack Gilbert Holtzclaw . . . through whose persistent effort and discerning leadership this Roanoke Rapids Power Station was made possible."

The new plant is Vepco's first big hydro development. It brings the system's total generating capacity to 1.25-million kw and spreads service to 657,000 customers in North Carolina, Virginia, and West Virginia. The company has a tenth major plant scheduled for completion at Yorktown, Va., next year. This will burn coal and coke and gas by-products from the nearby American Oil Co refinery.

As this new development pumps electric energy through the Vepco system in Virginia and North Carolina, the company is girding itself for another fight. A showdown is coming up on its application for the Gaston (N. C.) project, between Roanoke Rapids and Kerr Dam.

Application for Gaston was turned in to FPC in August 1951. It envisions a $35-million storage unit, supplying three power units capable of about 87,000 kw.

The fight this time is unique in the history of FPC. It is based on the contention of conservation groups, worried over the future of migratory fish and of paper manufacturing plants downstream, that oxygen and manganese content of Roanoke River water will be affected if Gaston is built between the two other dams.

They claim the aerating effect of the open stretch of river between Kerr Dam and Roanoke Rapids is necessary to restore the depleted oxygen content and reduce the manganese concentration built up while the water stands in storage behind Kerr's walls.

TVA's Profits-for-Expansion Plan Probed

Comptroller General warns that move can be checked only if Congress amends law

The Tennessee Valley Authority is planning to add 1,170,000 kw to its system without Congressional approval —a move which the Comptroller General of the U. S. warns can be halted only if Congress amends the law.

In a letter to Rep John Taber (R-N. Y.), ranking Republican and former chairman of the House Appropriations Committee, Comptroller General Joseph Campbell warned "the present law, as currently applied, does not give the Congress effective control over TVA's expenditures of public funds for power facilities."

Campbell had been asked for his views on TVA's plans to spend power revenues on new steam units, despite the fact the Government Corporation Appropriations Act of 1948 specifically forbids the agency from using power income to start new projects.

Campbell's investigation showed that Congress can most effectively control TVA's spending through appropriations. However, if it wants to permit TVA to use its power revenues for funds obtained from other sources to build new power plants, Congress should make it a requirement of TVA to obtain specific and prior approval from Congress.

On September 28, 1955, the TVA board submitted to the Budget Bureau a plan to use power profits to add five new steam units at existing steam plants. A short time before this, the board had, by 2-1 vote, ordered the first $3.5-million worth of equipment for the John Sevier unit, basing its ability to pay on income from its power sales.

Recently the house endorsed the TVA board's request to use power revenues to pay for the initial equipment at Sevier.

Meanwhile, the two Democratic holdovers on the TVA board—Harry Curtis and Raymond Paty—continued to out-vote Eisenhower-appointed Chairman Herbert D. Vogel in moving ahead on a $178-million expansion. On January 17, 1956, with Vogel abstaining, they authorized acquisition of equipment for Gallatin and Johnsonville Plants. With the Sevier unit, total planned additional installations hit 1,170,000 kw.

Campbell's report warns that this is only the beginning. He said, "It is clear that the language of the 1948 Appropriations Act . . . prohibits TVA from building a new steam electric plant at a new location without prior Congressional approval; however, it should be realized that TVA has the potentiality for expansion at some of its existing steam plants. . . ."

Campbell pointed out that the actual repayment for investment in its plant is determined by the TVA board. And should the pro-expansionists board as now constituted vote in favor of returning less than this to the Treasury in the next few years, it would have far more cash available for additions to its existing steam plants.

Westinghouse to Boost Sales

. . . of consumers goods to recapture loss from 156-day strike; "all-out effort" calls for year's sales volume in 9 months

Westinghouse Electric Corp wants to produce and sell a year's volume of consumer goods in the nine months remaining in 1956.

With its 156-day-old strike settled and its production lines pretty much back to full speed, the company last week laid out its plans to recoup its share of the market and advance its consumer product sales to $1 billion "within a very few years."

"It's going to be an all-out effort," declared Chris J. Witting, vice president and general manager of Westinghouse's consumer products divisions. "We expect to boost sales of our appliances, lamps, radios and television by 35% or more over 1955 levels in the remaining nine months of 1956."

To do the job, officials announced the largest advertising and promotion campaign in its 70-year history. Keyed to the theme, "Watch Westinghouse," Witting said the program would cut across all of the Westinghouse product line. A pre-sell campaign will get underway April 16 with radio and newspaper advertising in all market areas. Magazine and television ads will follow including messages on the Westinghouse-sponsored coverage of the political campaigns next summer.

Witting wouldn't say what the program would cost during the remainder of the year, but he indicated it will run near $32 million. "We've got to pay the price of admission to get a ringside seat," declared John W. Craig, vice president, appliance divisions.

Craig said he didn't know yet how much Westinghouse had lost by the strike in the way of distribution channels, but he did list some assets. Said he: "Our distributor-dealer organization is pretty much intact, and we didn't lose one exclusive dealer during the strike. He noted too that the back-to-work movement by production workers has been highly gratifying. "We're ahead of production in our Columbus, Ohio, refrigerator plant and within the next 10 days all other appliance production will be ahead of normal."

Upper Colorado Set to Begin

. . . with Reclamation construction forces alerted; four dams included in project which now awaits President's signature

Reclamation Commissioner W. A. Dexheimer has alerted his field force to get on its toes for the work ahead on the $760-million Upper Colorado River Storage Project, one of the bureau's biggest reclamation jobs in a long time.

Dexheimer recently told a bureau construction engineers' conference the agency has the organization to handle the job. His comment came as word was awaited that President Eisenhower had signed the bill just passed by Congress authorizing construction of Glen Canyon, Flaming Gorge, Navajo, and Curecanti Dams and 12 participating irrigation projects. The system will boost the Colorado area's generating capacity by almost one million kw.

About two weeks ago, the bureau received from its Salt Lake City (Utah) regional office an interim report reversing a previous finding on Curecanti Dam. The old bureau report had tabbed a 54,000-kw single dam Curecanti plan nonfeasible. The regional office reworked the plan to include three additional downstream power dams which would reuse the water and beef up total power to 152,000 kw. The office now feels the dam would be a feasible unit of the system. It would cost approximately $88 million and contain four power plants in all.

When it adopted the House version of the Upper Colorado bill, Congress agreed to delete language earmarking certain percentages of the total authorization of $760 million for each of the projects.

This means that, if the Reclamation Bureau endorses its field office report and recommends feasibility of Curecanti, some of the authorized funds can be used to begin Curecanti along with the others. The bill placed before the President requires an Interior Department finding of feasibility before Curecanti construction can begin.

Ellis-PUD Suit Dismissal Clears Priest Rapids Plan

A court action questioning the right of Grant County Public Utility District, Ephrata, Wash., to construct Priest Rapids Power Project on the Columbia River was recently dismissed by Grant County Superior Court at the request of Paul G. Ellis, Ephrata contractor who originally filed the suit.

"After Mr Ellis and his attorney examined our records and received depositions from our commissioners, they apparently found that the district was proceeding in a legal and orderly manner," said Glenn Smothers, PUD manager.

The lawsuit asked for a declaration as to whether the PUD could lawfully enter into a contract to build the dam and for a permanent decree preventing further work on Priest Rapids by the PUD. (EW, Apr. 2, p 79.)

Finance Plan Is Defeated for Beaver Marsh Project

At Eugene, Ore., a municipal Water & Electric Board proposal to issue $8.5 million in revenue bonds to finance construction of Beaver Marsh Hydro Project was defeated recently. The vote, sharply influenced by conservationist demands to protect fish and recreation values on the Upper McKenzie River, was 2,238 against, 1,846 for.

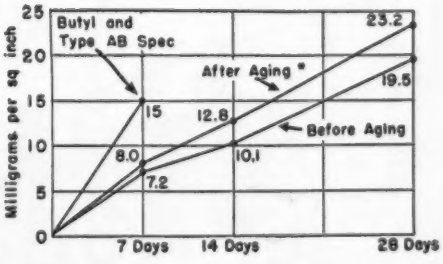
Eugene Water & Electric Board directors announced that defeat of the city charter amendment meant the board would abandon its proposal. The Federal Power Commission has licensed the project to develop 30,000-kw peak capacity.

Amazing moisture resistance of Anaconda's Type AB butyl high-voltage insulation helps reduce failure due to moisture.

When you can't keep cable out of moisture

New insulation keeps moisture out of cable

Exceptional moisture resistance is provided by Anaconda Type AB butyl insulation.



RESULTS OF mechanical moisture absorption test show Type AB retains good moisture resistance even after aging.

Where rubber-type cable is installed in underground ducts or buried directly in the earth, the moisture-resistance properties of the *insulation* are vitally important.

Latest facts show *Anaconda's Type AB butyl high-voltage insulation absorbs far less moisture* than industry standards permit. For the mechanical moisture absorption test, the industry has regarded 15 milligrams increase in weight per square inch of exposed surface, after 7 days' immersion at 70C, as a criterion for satisfactory moisture resistance. Type AB easily meets that requirement – in fact, typical results show it absorbs less than 7.2 mg. in 7 days.

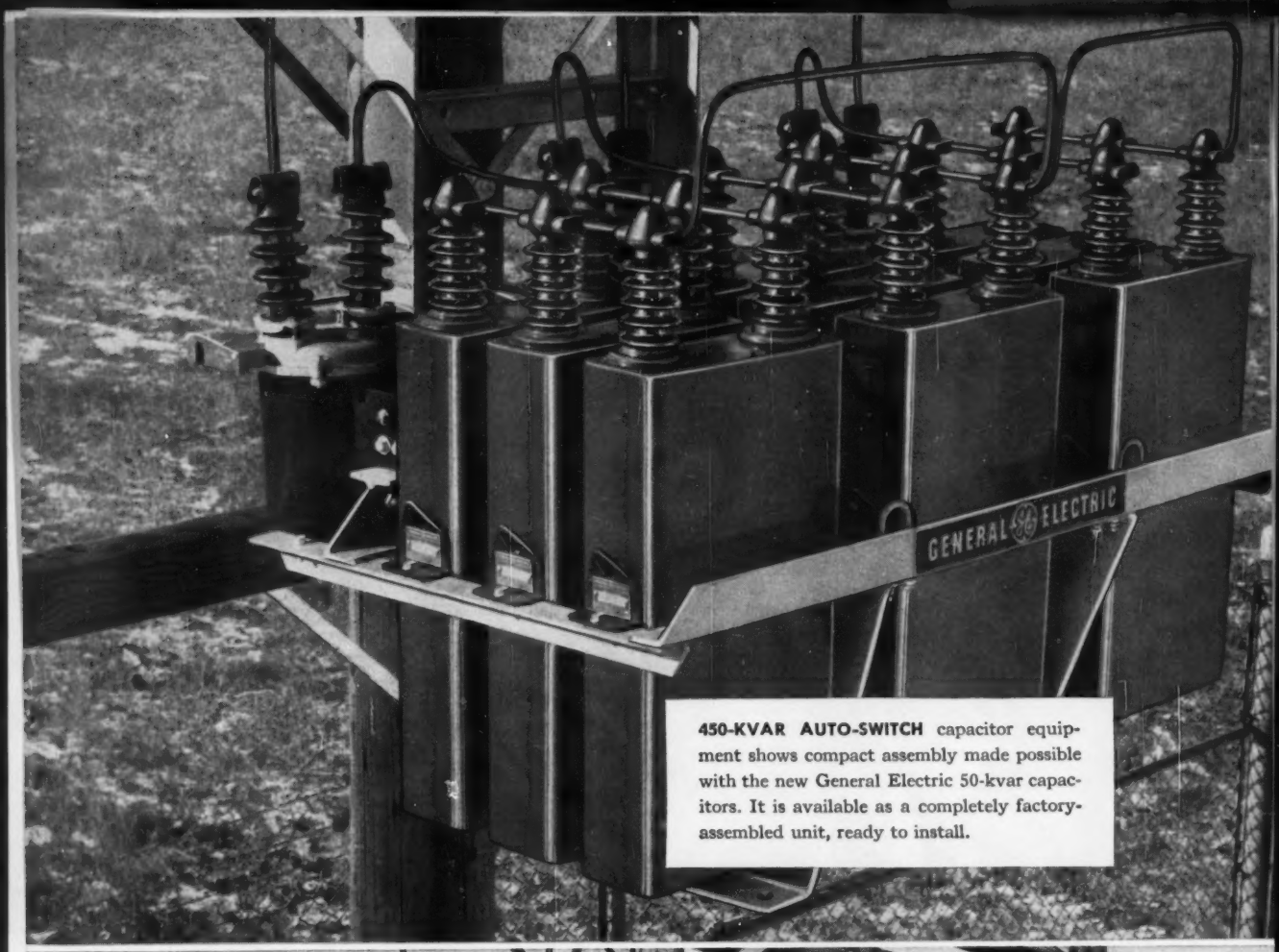
New Engineering Bulletin EB-27 gives you full details on performance of Type AB insulation in 15 Industry Specification tests. Ask the Man from Anaconda for your copy. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

56296

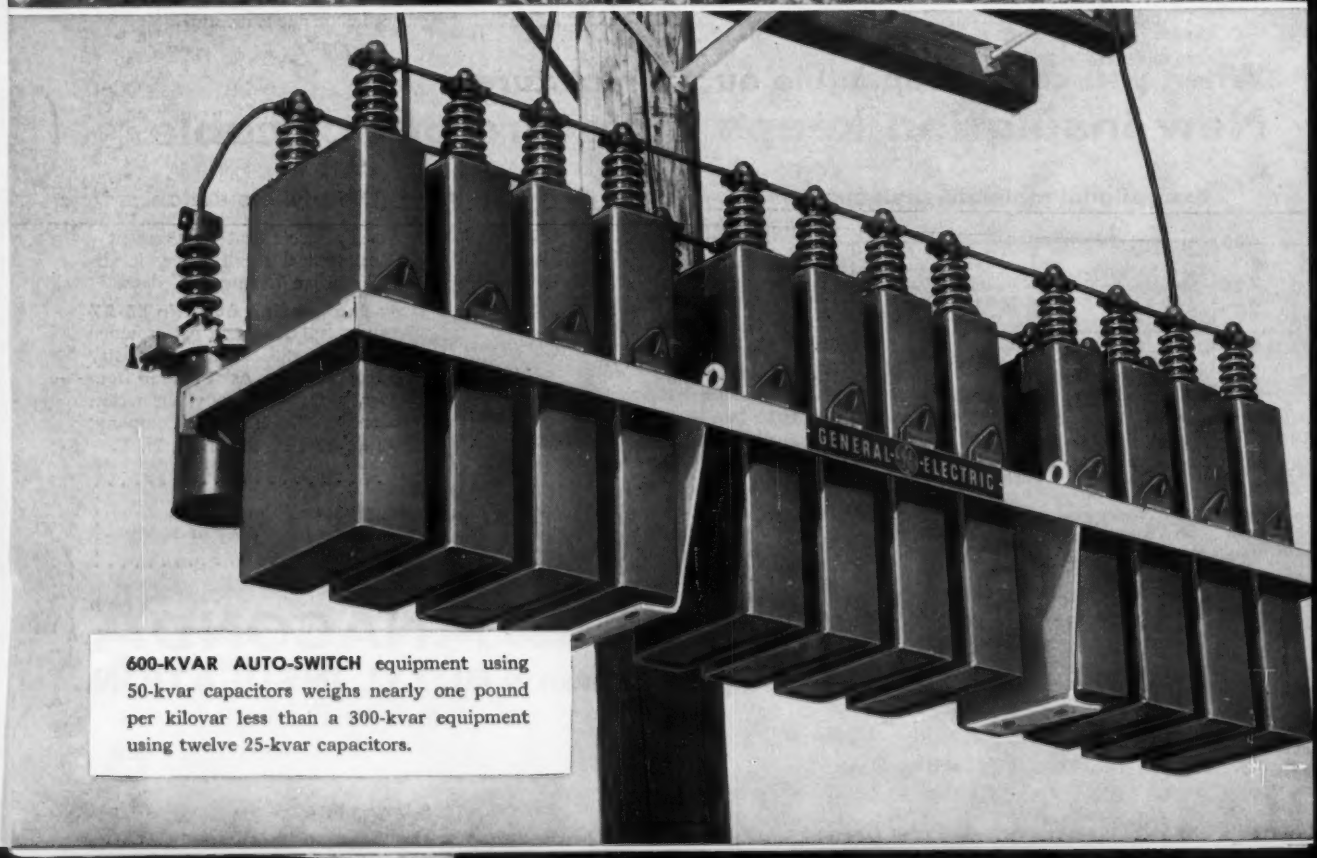
Get all the facts on Anaconda butyl. Write today –

ASK THE MAN FROM ANACONDA®

–PIONEER IN BUTYL INSULATION



450-KVAR AUTO-SWITCH capacitor equipment shows compact assembly made possible with the new General Electric 50-kvar capacitors. It is available as a completely factory-assembled unit, ready to install.



600-KVAR AUTO-SWITCH equipment using 50-kvar capacitors weighs nearly one pound per kilovar less than a 300-kvar equipment using twelve 25-kvar capacitors.

New G-E 50-kvar Capacitors Double Auto-switch Capacity

Higher rated units mean lower costs, less weight and bending moment, lower switching cost, per installed kilovar

General Electric's new 50-kvar capacitors, designed so that they have the same mounting dimensions as existing 25-kvar units, now enable you to put MORE kilovars on the pole with sizeable savings in space, weight, and cost per kvar.

More compact equipments made possible with these new capacitors can give you double the kilovars formerly available in 25-kvar capacitor equipments with little or no increase in rack dimensions. Racks are factory assembled, and are available in ratings from 2400 to 13,800 volts.

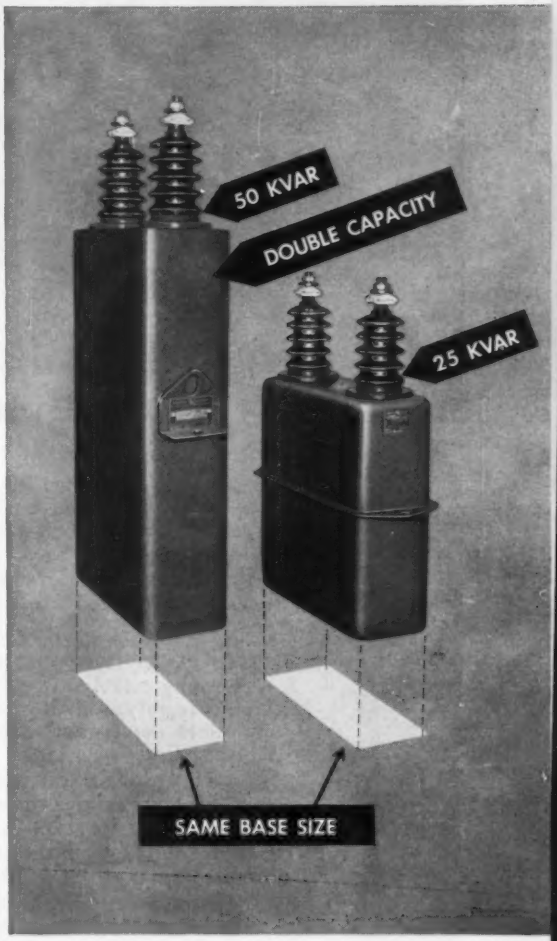
Reduced weight per kvar is made possible because one 50-kvar capacitor weighs approximately 15% less than two 25-kvar units. This results in even further weight savings in complete auto-switch equipments. For example, a single row auto-switch made up of twelve 25-kvar units weighs about 1110 lbs or 3.7 lbs per installed kvar. Use of 50-kvar units in the same arrangement gives you a pole-mounted equipment of only 2.8 lbs per installed kvar.

This 25% savings in weight per installed kvar is doubly significant. It means that bending moment on poles, an important consideration today, may be notably reduced per installed kvar by the use of 50-kvar capacitors in pole-mounted equipments.

Low kilovar costs also result from the use of 50-kvar capacitors. One 50-kvar unit costs 10% less than two 25-kvar capacitors. And, in switched equipments, switching cost can be reduced as much as 13% since a 600-kvar auto-switch requires no more switches than a 300-kvar equipment.

New features, too, have been built into the 50-kvar capacitor auto-switch designs. New neoprene switch terminal boots require no taping. Self grounding washer-head mounting screws eliminate loose parts, and provide permanent unit case grounding.

Orders are now being accepted for the new, higher rated auto-switches. The new bulletin, GEA-6485, contains full information on the 50-kvar capacitor equipments. Just contact your G-E Apparatus Sales Representative, or write to the General Electric Company, Section 441-34, Schenectady 5, New York.

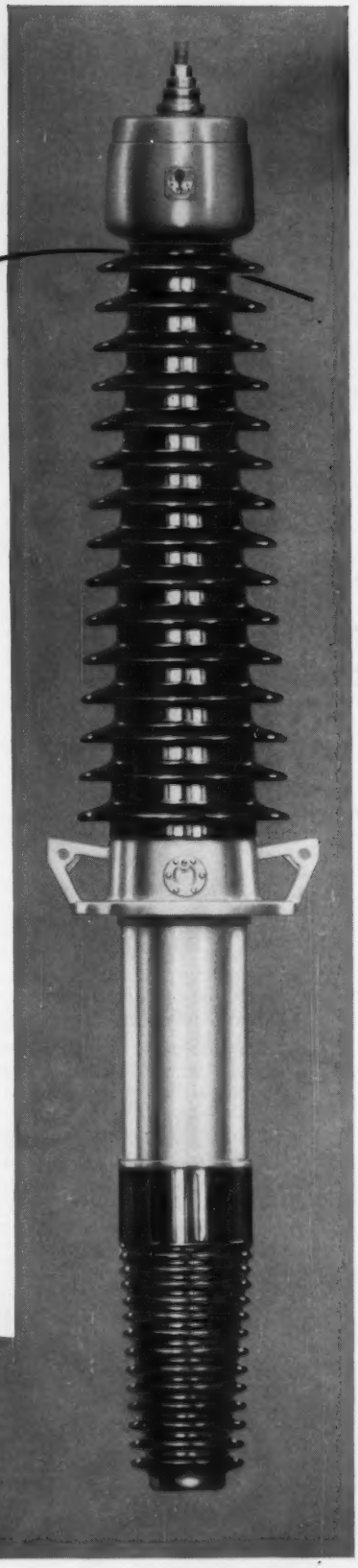


NEW G-E 50-KVAR CAPACITOR has been designed so that it will be interchangeable with existing 25-kvar units having standard NEMA mounting dimensions. Doubled capacity is achieved with an increase of only eleven inches in height over the 25-kvar G-E unit. It is available in both 5- and 8.7-kv classes.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Now... All the Way to 230 kv



With New Small-Diameter O-B Bushings

O-B has now completed its range of small-diameter, light-weight apparatus bushings to include 230-kv operating voltage. A few quick facts about these new bushings are --

1. In this higher range (69 to 230 kv), the insulating core is surrounded with oil from end to end.
2. This core utilizes full condenser construction, comprised of multiple layers of foil and paper.
3. O-B's long-established principle of spring compression assembly, combined with improved gasketing practices, assures the vital function of permanently tight sealing.
4. In the 115 to 230-kv range, all bushings are equipped with oil level gauges and capacitance taps.
5. National Standards for these voltages have not yet been formulated, but the present O-B design is fully in line with up-to-date trends.
6. These new models extend upward in rating from the present ASA Standard series covering 23 to 69 kv. There is now an O-B bushing available for all popular operating voltages, embodying modern dimensional requirements.

One more fact -- of prime importance. For nearly 50 years, O-B has manufactured bushings that have earned the reputation for being the best of their times. This has provided priceless experience and background in embarking on design of the new O-B bushing -- a worthy member of an illustrious family.

4640-H

Ohio Brass

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

Japan's Sakuma Dam Nears Completion

Sakuma Dam, tallest in Japan and reportedly seventh highest in the world, will ease the country's critical electrical shortage when it goes into full operation this summer.

The 492-ft structure, located on the Tenryu River between Tokyo and Osaka, was built by Electric Power Development Co of Japan and is the result of American design and equipment and Japanese work and engineering.

Downriver view of the dam (right) in central Honshu shows the reservoir that fills when the heavy rains begin in early spring.

The main and secondary cofferdams can be seen in center foreground. The $72- to $92-million dam and powerhouse, when visualized by Tatsunosuke Takasaki, first president of Electric Power Development Co, was called an "impossible project." Steep granite hills bank the river which drops 2,500-ft in 100 miles. The project has taken two and one-half years to construct instead of the estimated ten years.

The dam is seen as forerunner of other such projects needed to meet Japan's power requirements.

Utilities for Niagara Backed

Opposition to development of Niagara River power by New York State has been voiced almost unanimously by upstate New York members of the House of Representatives.

This stand was revealed in replies to a telegram sent by E. R. Eastman, president and editor of American Agriculturist magazine, which recently conducted a survey to determine opinions of House members concerning state versus private development.

Eastman's telegram read as follows:

"Over 200 organizations including every statewide farm organization, hundreds of business groups, State Federation of Labor, and practically all well-informed citizens are opposed to state development of additional electric power from Niagara. Are you? Much appreciate your answer by wire collect."

Telegrams were not sent to members of the House from New York City and vicinity because the magazine does not circulate in that area.

Neither was one sent to Sen Herbert H. Lehman (D—N. Y.) who, said Eastman, "contrary to the wishes of thousands of his constituents, has led the fight for socialism in the Senate to have the state of New York instead of free enterprise develop the additional power from Niagara."

Eastman, however, said that Sen Irving M. Ives (R—N. Y.) had indicated he "would do everything he could in support of private enterprise in this project."

Conclusions of the survey, published in a recent issue of American Agriculturist, showed that, with three exceptions, all upstate New York representatives in Congress favored private development. Two of the Congressmen queried took no stand on the issue, and one did not reply.

"Few people realize," he said, "how important this question is. If the State of New York succeeds in getting control of the Niagara power, not only will the taxpayer pay the $400 million necessary to develop the power, but taxpayers will also lose millions of dollars in taxes which private enterprise would pay on the development and operation. . . .

"If the socialists succeed in having the state grab Niagara we have established yet another precedent for centralized government, for bureaucracy, and for further restrictions on the rights of the individual."

AEC Offers Atom Exhibits

Materials depicting peacetime uses of the atom are available free to those who plan a show for informational purposes. Atomic Energy Commission has announced that transportation and rental costs formerly charged against all exhibitors have been dropped providing no "commercial exploitation" is involved. Bookings are obtainable from American Museum of Atomic Energy, Oak Ridge, Tenn.

By Trading Process Steam for Fuel . . .

Linden Achieves High Economy

GENERATION
Design

PSE&G Co's new Linden generating station is expected to achieve a fuel economy of 54% without an increase in steam conditions.

F. P. FAIRCHILD, Chief Engineer, Electric Engineering Dept, Public Service Electric & Gas Co, Newark, N. J.

Located adjacent to Bayway refinery of Esso Standard Oil Co, Linden Station of Public Service Electric & Gas Co will supply process steam at 150 and 750 psig for oil refinery processes. Part of the electrical output also will be transmitted to the refinery. Rest will be fed into the PSE&G Co system. In return, the refinery will supply residual fuel oil and raw water to the generating plant.

None of the principles applied in this plant is new. However, equipment size, magnitude of throttle and process flows (see box), and the high economy achieved constitute a significant advance in steam power plant engineering.

Economy is substantial because plant has two unusual uses for low level heat energy normally rejected to condenser cooling water:

1. Heat is required for oil refining processes.

2. Heat is required to raise temperature of the unusually large feedwater makeup flow that compensates for delivery of steam to refinery processes.

Usually the price of higher economy has been increased steam conditions and the added complication of such features as reheat, pressurized furnaces, and gas recirculation. The price of improved economy at the Linden generating station lies in the added complication of:

Adapted from a paper presented by the author at the American Power Conference, on March 23, 1956 in Chicago, Ill.

VITAL STATISTICS

	Unit No. 1	Unit No. 2
Turbine generator rating, Mw	225	225
Throttle steam pressure, psig	2,000	2,350
Throttle steam temperature, deg F	1,050	1,100
Reheat steam temperature, deg F		1,050
Steam flow to turbine, millions of lb/hr	2.8	1.82
Max process steam extraction flow @ 750 psig, lb/hr	600,000	.....
Max process steam extraction flow @ 150 psig, lb/hr	1,000,000*	400,000
Feedwater make up requirements, %	40-60	
No. of boilers	three	one
Stages of feed heating	six	eight

*Sum of the two limited to 1.15 million lb/hr at any one time.

1. Automatic steam extraction from turbines.

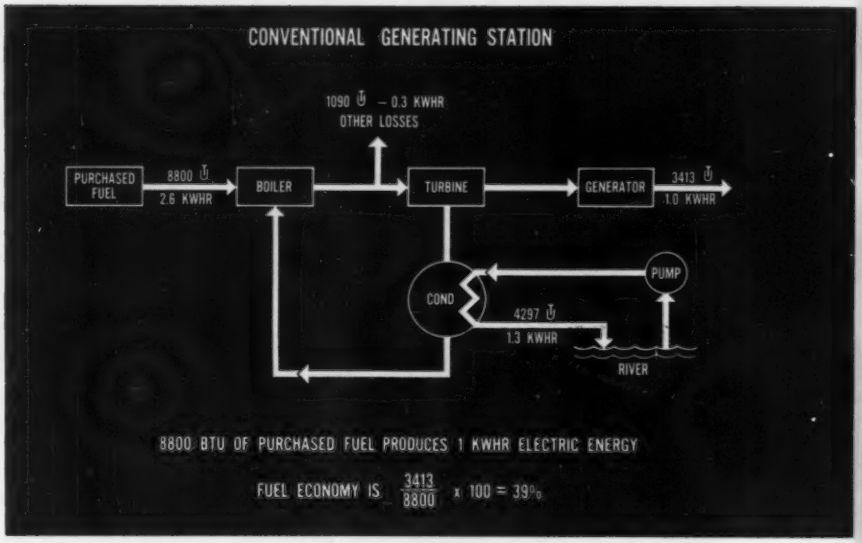
2. Water treating plant for high make-up.

3. Special features for handling and burning high viscosity fuel.

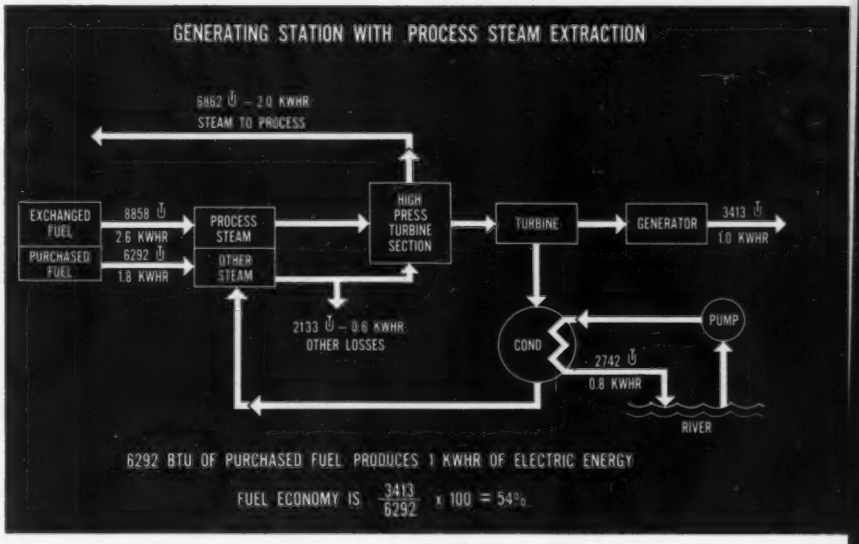
4. Provisions to assure reliability of steam supply.

In the usual application of extraction steam turbine-generators, the entire output of steam and electric energy goes to same user. The necessity of maintaining a balance between the two sometimes results in undesirable limitation of operation. At Linden, however, steam goes to an oil refinery while electric output goes to both the refinery and Public Service system. This arrangement makes it possible to build a plant capable of generating highly economical non-condensing power in quantities much greater than electric requirements of the refinery.

Contractual arrangement provides that Public Service will deliver to Esso the entire steam requirement of Bayway Refinery in exchange for fuel and raw water. Additional fuel required to operate units at full electric output is delivered at commercial rates. Basic fuel for both commitments will be high-viscosity residual fuel. When there is not enough, deficiency will be made up by Bunker C fuel oil. Raw water delivered by the refinery is purified, filtered, and demineralized at generating station. Electric energy will be delivered to refinery at regular wholesale rates.



FUEL ECONOMY shows large improvement in a plant providing process steam because of use of low level heat energy that is normally rejected to condenser cooling water. Economy increases from 39 to 54% for an improvement of about 38%



Three Boilers, One Turbine

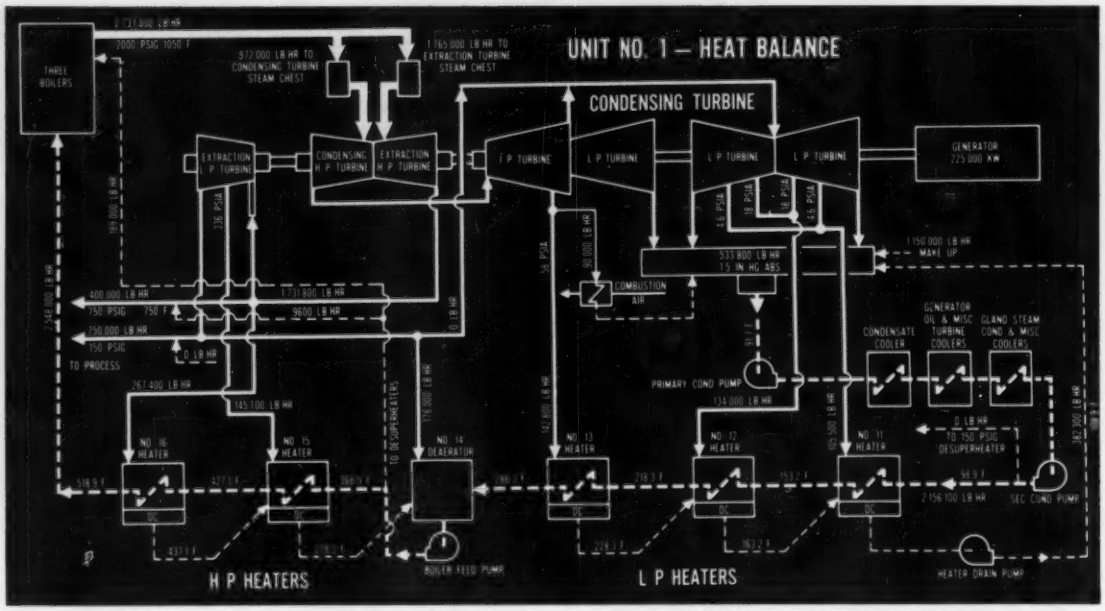
Initial concept was a plant consisting of only one 225-Mw automatic double-extraction turbine-generator supplied by three boilers on a header serving both turbine and pressure reducing and desuperheating equipments which supply process steam directly to refinery when the turbine is shut down.

The unusual ratio of three boilers to one turbine was chosen for reliability of steam supply. Two boilers are enough for unit operation with full turbine extraction flow.

Throttle steam conditions of 2,000 psig and 1,050F were chosen as a design compromise between reliability, cost, efficiency, and optimum turbine design for extraction of process steam. With three boilers, a steam turbine, and two reducing stations connected to a double steam header, it was desirable to avoid complications of reheating and higher cost of steam piping system with austenitic steel valves. Therefore upper limit for steam temperature was set to allow use of ferritic steels. Throttle steam pressure was determined from exhaust conditions necessary to satisfy refinery requirements.

A second unit will be required soon after the first to meet increasing demands of Public Service electric system. Because of the dependability of process steam supply from the first unit, high steam temperature, reheat, and one boiler are used for the second turbine-generator. But it was felt that this 225-Mw unit should also be designed to furnish extraction steam to refinery at lower pressures. Thus, there is capacity in second unit to meet increasing steam demands of the refinery.

Cost of operating first unit will be relatively insensitive to fluctuations of fuel prices because amount of exchanged fuel burned is large in respect to total fuel required. Although it is unlikely that solid fuel will be burned in boilers of this unit, there is space for


UNIT NO. 1 — HEAT BALANCE
THREE BOILERS
2000 PSIG 1050 F
972 000 LB HR TO CONDENSING TURBINE STEAM CHEST
1 765 000 LB HR TO EXTRACTION TURBINE STEAM CHEST
CONDENSING TURBINE
EXTRACTION L P TURBINE
CONDENSING H P TURBINE
EXTRACTION H P TURBINE
I P TURBINE
L P TURBINE
L P TURBINE
L P TURBINE
GENERATOR 225 000 KW
316 PSIA
18 PSIA
4.6 PSIA
1 150 000 LB HR MAKE UP
533 800 LB HR 1.5 IN HG ABS
COMBUSTION AIR
400 000 LB HR 750 PSIG 750 F
1 731 800 LB HR
9600 LB HR
250 000 LB HR 150 PSIG TO PROCESS
0 LB HR
267 400 LB HR
145 100 LB HR
GENERATOR OIL & MISC TURBINE COOLERS
GLAND STEAM COND & MISC COOLERS
CONDENSATE COOLER
PRIMARY COND PUMP
134 000 LB HR
0 LB HR TO 150 PSIG DESUPERHEATER
NO 16 HEATER
NO 15 HEATER
NO 14 DEAERATOR
NO 13 HEATER
NO 12 HEATER
NO 11 HEATER
2 156 100 LB HR
SEC COND PUMP
TO DESUPERHEATERS
H P HEATERS
BOILER FEED PUMP
L P HEATERS
HEATER DRAIN PUMP

THREE BOILERS for the first unit provide reliability for the process steam supply. Steam is extracted from a low and a high-pressure turbine. Reheat cycle is not used because of the requirements imposed by the process steam demands

future installation of pulverized fuel equipment.

Proportion of exchanged fuel is smaller with second unit and as period of assured supply of purchased fuel is shorter, the second unit boiler was constructed so that only about two weeks outage would be involved in conversion to pulverized fuel.

Several design features will permit possible future change-over from oil to pulverized fuel firing with a minimum outage. These features include a division wall in each furnace, a Bailey block floor, space for gas tempering ports, gas tempering duct work, and space for slag taps and tanks at bottom of furnaces.

A 6,300-ft run of pipe extends from the Linden boilers to the Esso boiler house from where steam is distributed. There are two 30-in. lines for LP steam, two 16-in. lines for HP steam, one 8-in. line for high viscosity fuel, one 10-in. Bunker C fuel line, and one 16-in. raw water line with a 16-in. connection to the Elizabethtown Water Co.

Control room contains all usual central controls for the two turbine-generators and the four boilers and, in addition, all controls for extraction steam and pressure reducing stations. Complete station operation is handled from this point except water treatment equipment which is controlled locally.

First unit has three identical radiant-type boilers, using small tubes, 2 and 2½-in. OD, with radiant platen superheaters, and steam washers. They are constructed for pressure firing without induced-draft fans.

Because temperature of process steam must be maintained over a wide range of flow, boilers are designed for full steam temperature at 65% of full load, with spray attemperation to control temperature from that point to full load.

Design Permits Change-over

Radiant platen superheaters were selected because they help maintain steam temperature relatively constant over a wide range and they reduce gas temperature entering convection surfaces and so minimize slagging. Steam is washed with pure feedwater in a two-stage washer.

Because pulverized fuel may be burned in future, boiler design permits change-over to slag-tap furnaces. There is less heat absorbed in furnace when solid fuel is fired instead of oil, and furnace heat absorption is further reduced when lower surfaces are covered to facilitate slag tapping. When and if change-over occurs, radiant platen superheater surface will be converted to platen boiler surface, and gas recirculation will then be used to lower furnace exit gas temperature to acceptable levels by tempering. Changes are not expected to affect steam temperature.

Boiler for second unit is of radiant type using small tubes, 2 and 2½ in. OD, with both superheater and reheater of the radiant platen type, two furnaces, gas recirculation, and steam washers. It too is a pressurized-type without induced-draft fans.

In this boiler a relatively high proportion of total heat generated is absorbed in superheater and reheater. To facilitate the heat transfer, three distinctive design features are employed:

1. Radiant platens.

2. Two furnaces with differential, or bias, firing.

3. Gas recirculation, not only at control load, but also at full load.

High-temperature section of superheater is in one half of boiler, and entire reheater is in the other. Low temperature sections of superheater are distributed in both halves.

High-pressure steam temperature is controlled by gas recirculation. Differential firing controls reheated steam temperature. Attemperation will trim the high-pressure steam temperature. When oil is being fired, recirculated gas will be mixed with combustion air and will enter furnace through burners which can burn pulverized fuel and gas.

(*Continued on page* 20)

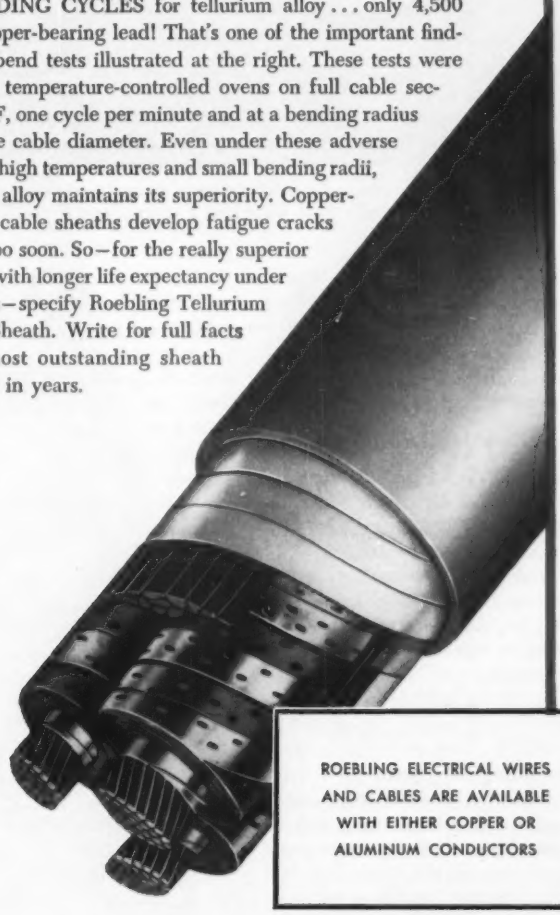
ROEBLING PAPER POWER CABLE WITH TELLURIUM LEAD ALLOY SHEATH

TELLURIUM LEAD ALLOY HAS

4½ TIMES

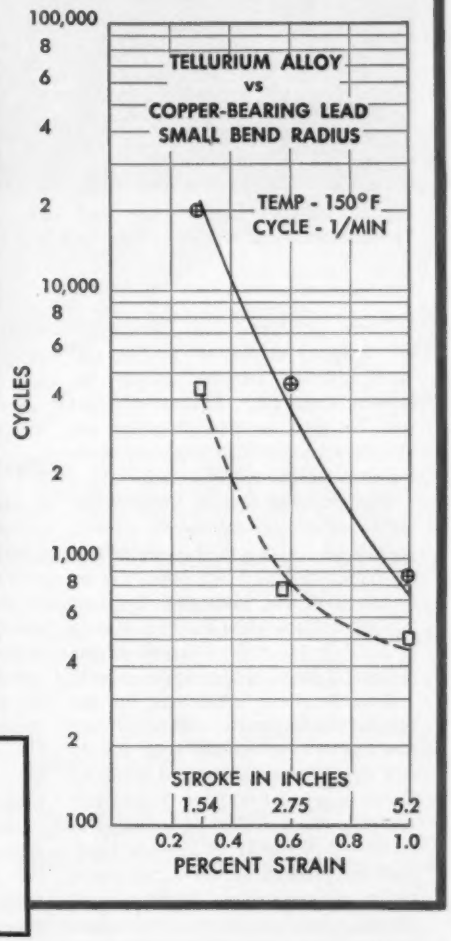
THE FATIGUE RESISTANCE OF COPPER-BEARING LEAD AT A BENDING STRAIN OF .3%

20,000 BENDING CYCLES for tellurium alloy . . . only 4,500 cycles for copper-bearing lead! That's one of the important findings from U-bend tests illustrated at the right. These tests were conducted in temperature-controlled ovens on full cable sections at 150°F, one cycle per minute and at a bending radius of 7 times the cable diameter. Even under these adverse conditions of high temperatures and small bending radii, the tellurium alloy maintains its superiority. Copper-bearing lead cable sheaths develop fatigue cracks *and fail* far too soon. So—for the really superior cable sheath with longer life expectancy under all conditions—specify Roebling Tellurium Lead Alloy Sheath. Write for full facts about the most outstanding sheath development in years.



U-BEND FATIGUE TEST

3/C - 350,000 CM - 2.7" DIA
BEND RADIUS - 19" - 7 x DIA
⊕ TELLURIUM ALLOY - 320° F QUENCH
□ COPPER BEARING LEAD

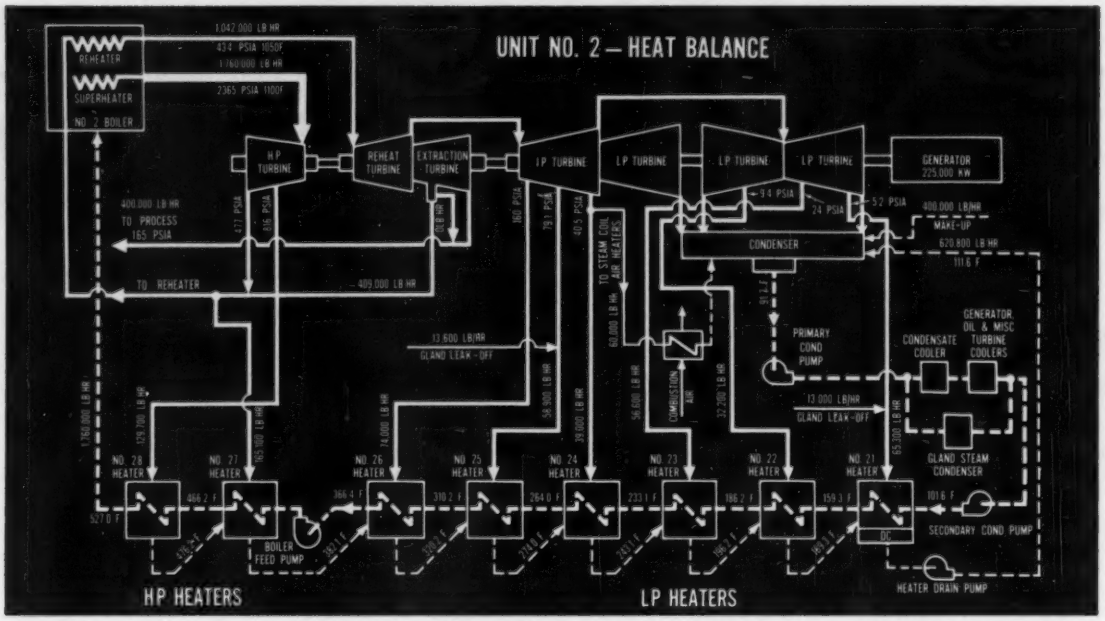


ROEBLING ELECTRICAL WIRES AND CABLES ARE AVAILABLE WITH EITHER COPPER OR ALUMINUM CONDUCTORS

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 11-15 STILLING ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13235 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, 1723 HENRY W. OLIVER BLDG. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.



SECOND UNIT will use only one boiler with a reheat cycle. Tandem-compound turbine is separated into four spans. In the first is an HP turbine; second, reheat and extraction turbines; third, an IP and a LP unit; and in the fourth LP units

Three horizontal-shaft air heaters are designed so that all heating surfaces may be removed radially by hoisting from top. Extraction steam will be used to heat entering air. Dampers are provided to permit washing air heaters at reduced load.

Throttle steam flow of 2,800,000 lb. per hr, which corresponds to a rating of 425 Mw in a straight condensing, conventional reheat machine, will be largest in world when this first unit commences operation in 1957. Rating of 225 Mw will make it largest double automatic extraction turbine ever built.

Throttle steam conditions for the first turbine-generator are 2,000 psig and 1,050F. Maximum total extraction steam flows are 600,000 lb per hr at 750 psig and 1,000,000 lb per hr at 150 psig. Sum of the two is limited to 1,150,000 lb per hr at any one time. Unit will produce 225 Mw over entire range of extraction. With the abnormal condition of zero extraction, steam will be bypassed externally from 150 psig extraction point (exhaust of low pressure extraction element), to cross-over entering triple-flow low-pressure element.

Because of the unusually large throttle flow, high-pressure element has a double-flow arrangement in which extraction steam for process flows toward generator, and steam destined for condenser flows toward front standard. Steam expansion from 750 psig extraction point to 150 psig extraction point takes place in a separate casing at front end.

Double Flow Has Advantages

Double-flow arrangement of high-pressure element has three important advantages. First, splitting high-pressure steam path into two streams brings steam flow per wheel within range of current experience. Second, it avoids necessity of designing control valves for flows of very large volume at the two extraction steam pressures. Third, opposing flows of steam minimize changes in total turbine thrust due to variations in either electrical load or process steam extraction.

Because of relatively high cross-over pressure at full load and zero extraction, two 36-in. steel pipes will carry steam to two of the triple-flow low pressure elements. Length of last stage buckets is 23 in. Exhaust hood will have side outlets.

To bypass No. 1 Turbine, two turbine-type control valves, each with independent hydraulic control gear, are provided to supply process steam directly from the three boilers.

Second generator will be driven by a 225-Mw, 3,600-rpm, tandem compound, triple-exhaust flow, single automatic extraction turbine. It will have a maximum throttle flow of 1,820,000 lb per hr and will start operation with manually controlled extraction of 400,000 lb per hr at 150 psig. Maximum throttle flow is equivalent to 275-Mw straight condensing reheat unit. Throttle steam conditions are 2,350 psig and 1,100F/1,050F.

Expansion of steam from 2,350 to 450 psig reheat pressure will perform work in nine-stage, single-flow, high pressure element. Second span consists of extraction element, through which the 150-psig extraction steam expands, and reheat turbine in which 1,050F reheated steam expands to about 200 psig. These two elements have been combined to bring stages of nearly equal temperatures adjacent to one another.

Six-stage intermediate-pressure turbine and six-stage single-flow portion of the triple-flow low-pressure turbine are combined in third span.

Last span is double-flow portion of low-pressure turbine. Three rows of 26-in. last stage buckets will be used. Exhaust hood will have two side-outlet openings.

Single external valve chest, two stop valves, and first stage nozzle boxes will be made of type 347 stainless steel because of 1,100F throttle steam

(*Continued on page* 24)

Connect
COPPER with COPPER
ALUMINUM with ALUMINUM
use...

PAC-5
ACSR 6—1/0 Cu. 8—1/0

PAC-3
ACSR 8—2 Cu. 8—2

PAC-4
(formerly PAC 6—0)
ACSR 6—1 0 Cu. 6—2

PAC-7 (replaces PARC 6—0)
ACSR 1 0—336.4
6—1 0 A R Cu. 8—1 0

BLACKBURN COPPER TO ALUMINUM FITTINGS

BLACKBURN PAC CLAMPS

ELIMINATE CORROSIVE SOLDERS, VOIDS AND FLUXES !

There are many satisfactory copper connectors for connecting copper conductors.

There are many satisfactory aluminum connectors for connecting aluminum conductors.

Blackburn's PAC clamps combine the features of a good copper connector and a good aluminum connector to give you the best copper to aluminum connector available.

Our exclusive method (Patent applied for) of pressure casting molten corrosion resistant aluminum alloy around specially treated pronged copper liners establishes an intimate, low resistance contact of the two metals without using corrosive solder.

The copper liners, which cannot be mated incorrectly, surround the copper conductor establishing a good copper to copper contact.

The aluminum grooves surround the aluminum conductors, establishing a good aluminum contact.

Adequate contact surface and conductor separation is built into Blackburn's PAC clamps to insure long-lasting, trouble-free copper to aluminum connections without setting up cold flow or galvanic corrosion.

Spring action is inherent in the design of PAC clamps and is supplemented with an extra-heavy spring lockwasher insuring permanently tight connections which will withstand temperature fluctuations.

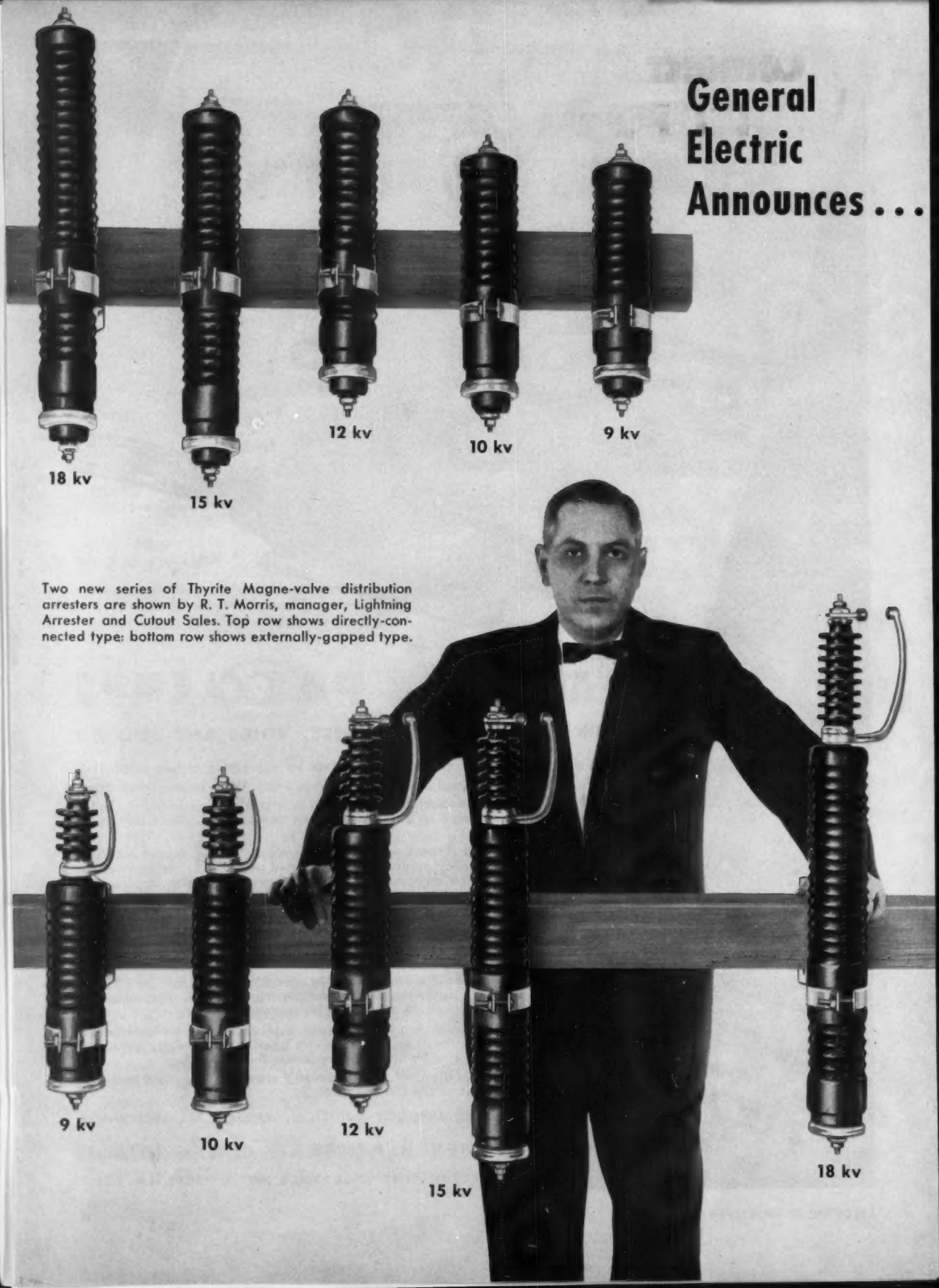
Hot dipped galvanized steel hardware is standard. Aluminum hardware available on all but Catalog #PAC-3.

AVAILABLE THROUGH ELECTRICAL WHOLESALERS EVERYWHERE

JASPER BLACKBURN CORPORATION

35 MADISON STREET • ST. LOUIS 6, MO. • PHONE: MAin 1-2821

General Electric Announces . . .



Two new series of Thyrite Magne-valve distribution arresters are shown by R. T. Morris, manager, Lightning Arrester and Cutout Sales. Top row shows directly-connected type; bottom row shows externally-gapped type.

.....A COMPLETE NEW LINE OF MAGNE-VALVE DISTRIBUTION ARRESTERS

Smallest, lightest, valve-type arresters, with a proven operating principle that assures maximum system protection

Intensive General Electric research into improved lightning protection for distribution circuits has now resulted in a new and advanced line of valve-type arresters—the only type that can be applied anywhere on a system regardless of available short-circuit current.

For the first time in distribution arresters, you get the advantages of the exclusive Magne-valve principle so successfully used in G-E station-type and line-type arresters—a combination of *magnetic* action of series gaps to augment the *valve* action of time-proven Thyrite* disks, giving the highest degree of protection ever offered for distribution circuits.

Smaller size and weight of these new arresters —only a fraction of that of comparable arresters—is a further advantage of the new design. They are intended for separate mounting to crossarm or direct-to-pole.

Ratings from 9 kv thru 18 kv are available in a choice of either the external-gap type—or direct-connected type with ground-lead disconnector. Both types give the best in overvoltage protection and both types provide positive protection against line-lockouts. Pellet-type arresters will still be available in voltage ratings 3 kv–15 kv to all users.

For full details of the new line of distribution arresters, check your nearest G-E Apparatus Sales Representative or write to General Electric Company, Schenectady 5, New York. Ask for bulletin GEA-6379. 432-17

*Reg. Trade-mark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

temperature. Inner and outer casings of high pressure element will be made of chromium-molybdenum-vanadium ferritic casing material.

Electrical output leaves station by three 138-kv transmission lines which carry bulk of the station's output and three 26-kv subtransmission cables which serve refinery substation. Main generators have liquid-cooled stator windings and air-gap, pick-up type direct gas rotor cooling.

Two Sources of Supply

Boiler auxiliaries of each unit will always have two sources of electric supply, whether or not associated turbine-generator is in service. There are three auxiliary power group buses for each unit. The three back-up buses are supplied from 26-kv system and feed auxiliaries common to both units and serve as starting and alternate sources of supply for the six buses.

Water treatment plant is divided into primary treatment and demineralizing process. Primary treatment equipment is designed to operate unattended with remote manual or automatic control. It receives raw water (which is fresh water drawn from nearby creeks) from Esso's reservoirs, chlorinates it to break-point, chemically treats it for coagulation of impurities, allows it to settle, filters it, and then delivers it to demineralizers. It is capable of producing 3,750 gpm of effluent essentially free of turbidity, color, oil, and organic matter.

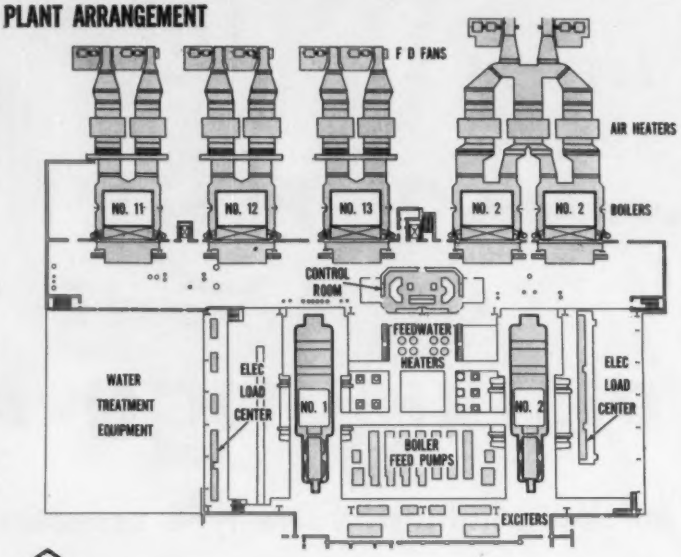
Water from primary treatment system flows through cation units for removal of calcium magnesium and sodium ions; through a vacuum degasser for removal of oxygen and carbon dioxide; through combination weak-base anion/strong-base anion units for removal of sulphate, chloride and nitrate ions, and silica; and finally through mixed bed units containing cation and strong base anion resin for removal of trace impurities and then to storage.

Demineralizing plant is designed to produce continuously 3,200 gpm of water of guaranteed quality with an influent having a total dissolved solids content of about 300 ppm. Provisions have been made for future expansion of the plant to 4,800 gpm capacity.

Regeneration and control of demineralizing equipment are automatic.

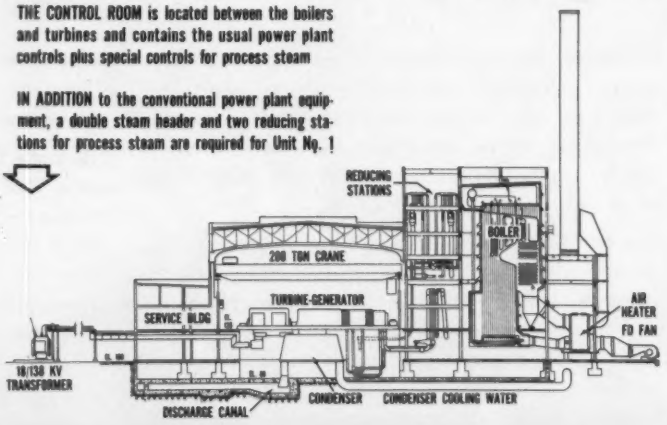
THREE 138-kv lines carry the bulk of output to the PSE&G system. Refinery is served by three 26-kv cables

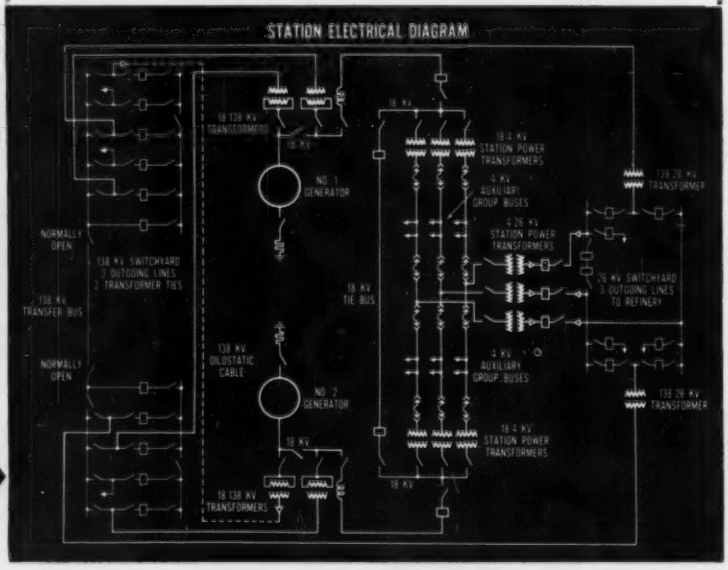
PLANT ARRANGEMENT



THE CONTROL ROOM is located between the boilers and turbines and contains the usual power plant controls plus special controls for process steam

IN ADDITION to the conventional power plant equipment, a double steam header and two reducing stations for process steam are required for Unit No. 1

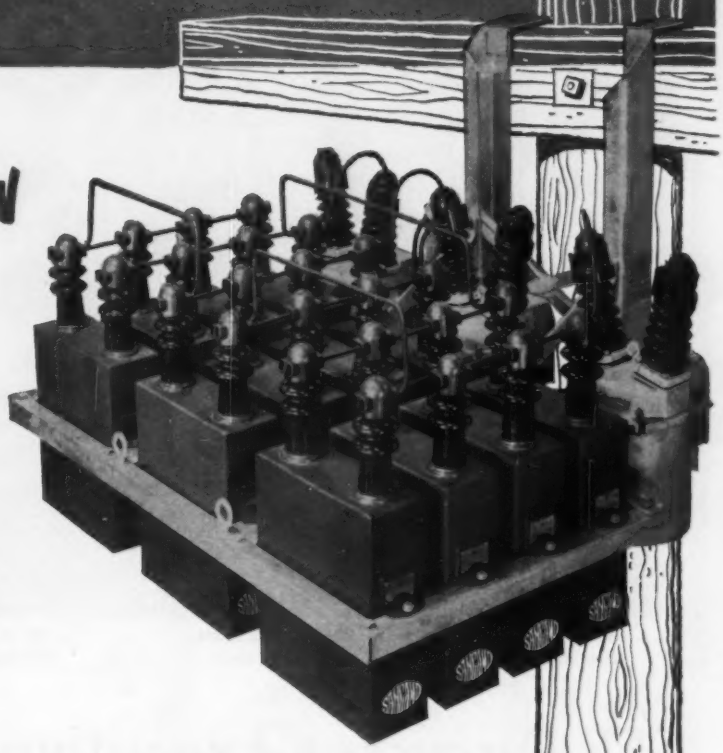



STATION ELECTRICAL DIAGRAM
18 KV
18 138 KV TRANSFORMERS
18 KV
NO. 1 GENERATOR
18-3 KV STATION POWER TRANSFORMERS
3 KV AUXILIARY GROUP BUSES
138 26 KV TRANSFORMER
NORMALLY OPEN
138 KV SWITCHYARD 3 OUTGOING LINES 2 TRANSFORMER TIES
26 KV SWITCHYARD 3 OUTGOING LINES TO REFINERY
26-3 KV STATION POWER TRANSFORMERS
138 KV TRANSFER BUS
18 KV TIE BUS
NORMALLY OPEN
138 KV OILOSTATIC CABLE
NO. 2 GENERATOR
3 KV AUXILIARY GROUP BUSES
18-3 KV STATION POWER TRANSFORMERS
138 26 KV TRANSFORMER
18 KV
18 138 KV TRANSFORMERS
18 KV

for quick, economical distribution circuit installations

choose

Sangamo's New Auto-Var Pole-Type Capacitor Equipment



Now Sangamo's Diaclor Power Capacitors are available in factory-assembled and wired Auto Var equipment for pole-type installation. They are designed for easy installation, structural soundness, and excellent electrical performance in the improvement of power factor.

They offer all these features:

- Sangamo 25 Kvar Diaclor Power Capacitors.
- Hot dip galvanized steel rock for cross-arm mounting.
- Available with or without electrically-operated oil switches.
- Weatherproof junction box with terminal block for control wiring.
- Insulating caps on all capacitor and oil switch terminals.
- Clamp-type ground stud that accommodates #8 to #2/0 wire.
- Neoprene jacketed, #6 solid conductor connections between units.

Write for full information.

SANGAMO

SANGAMO ELECTRIC CO.

SPRINGFIELD, ILLINOIS

GWILYM PRICE, Westinghouse | R. S. STEVENSON, Allis-Chalmers | W. J. CLAPP, Florida Power | HARLLEE BRANCH, Georgia Power

SEE Discusses Executive Problems

- **EEI Pres Harllee Branch says socialized power is still a threat**
- **Sutton, Carolina P&L president, urges aggressive attack on problem**
- **Robinson, Washington WP president, advises making friends with customers**
- **Boulet, Wisconsin PS Corp, claims house organs are not used effectively**

The most important problem facing the utility industry is halting the encroachment of subsidized power groups. This threat continues even under the present political administration, Harllee Branch, Jr., president of Edison Electric Institute and Georgia Power Co, told the Southeastern Electric Exchange annual meeting (March 12-14) at Boca Raton, Fla.

Branch pointed out that socialized power has made further inroads during the past three years. He substantiated this position with several illustrations. Most damaging example, he said, was Attorney General Brownell's opinion giving preference customers a monopoly in federally generated power. This went beyond anything the New Dealers and Fair Dealers ever conjured up, Branch said.

Other examples cited were the procrastination on the partnership program, the timidity regarding the Dixon-Yates fiasco, and lack of vocal support for development of Niagara River by private enterprise.

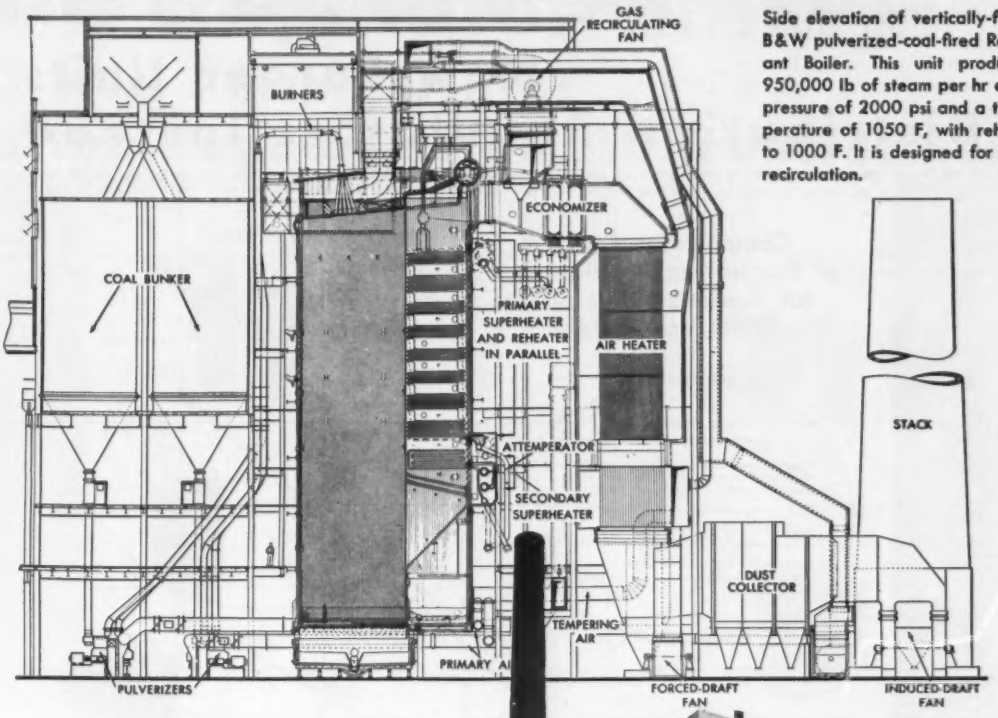
To combat the efforts of the socialized power group, L. V. Sutton, president, Carolina Power & Light Co, urged utilities to join together and attack the problem aggressively. One medium for doing the job is through the National Association of Electric Companies. He suggested that all companies join it.

An interesting part of Sutton's presentation was the "playing" of a phonograph record, which he said is used by the CIO at meetings. The record is political propaganda set to music. Many stanzas concern power. In nine of them the phrase "give away" is used, in one way or another, 29 times.

To get customers to act favorably, utilities must first make friends with their customers and secondly tell them what you want them to do and why. This formula paid off handsomely for Washington Water Power Co in the recent victory over a PUD, said Pres Kinsey M. Robinson.

Friends are made, he said, by talking about the customers' interest and postponing tedious talk about our-

(*Continued on page* 31)

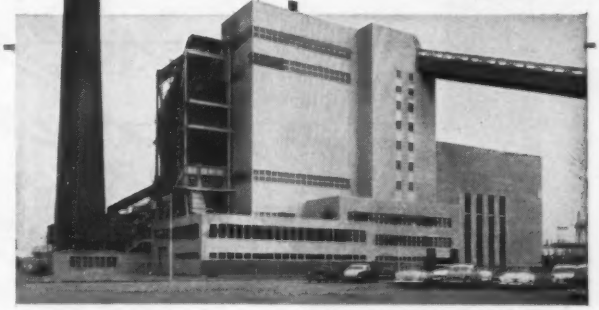


Side elevation of vertically-fired B&W pulverized-coal-fired Radiant Boiler. This unit produces 950,000 lb of steam per hr at a pressure of 2000 psi and a temperature of 1050 F, with reheat to 1000 F. It is designed for gas recirculation.

Modern Central Stations Serving America

Toledo Edison's BAY SHORE STATION

Equipped with a B&W Radiant Boiler



View of Bay Shore Station, latest addition in Toledo Edison Company's expansion program, George W. Saathoff, Consulting Engineer.

Bay Shore Station—a significant addition to Toledo Edison's generating capacity—is concrete evidence of that company's policy of combining a dynamic expansion program with the latest engineering advances.

This new 135,000-KW unit, which gives Toledo Edison a total installed capacity of over ½-million kilowatts, is the latest in a $90,000,000 program carried out over the past several years. Full use has been made of latest engineering developments, including high steam pressure and temperature, reheat, and gas recirculation.

B&W Boilers such as that installed in Bay Shore Station are the product of almost a century of boiler making experience, combined with the practical advances gained through B&W's continuing program of research and development—a combination that is making basic contributions toward increasingly efficient steam-electric power generation. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, New York.

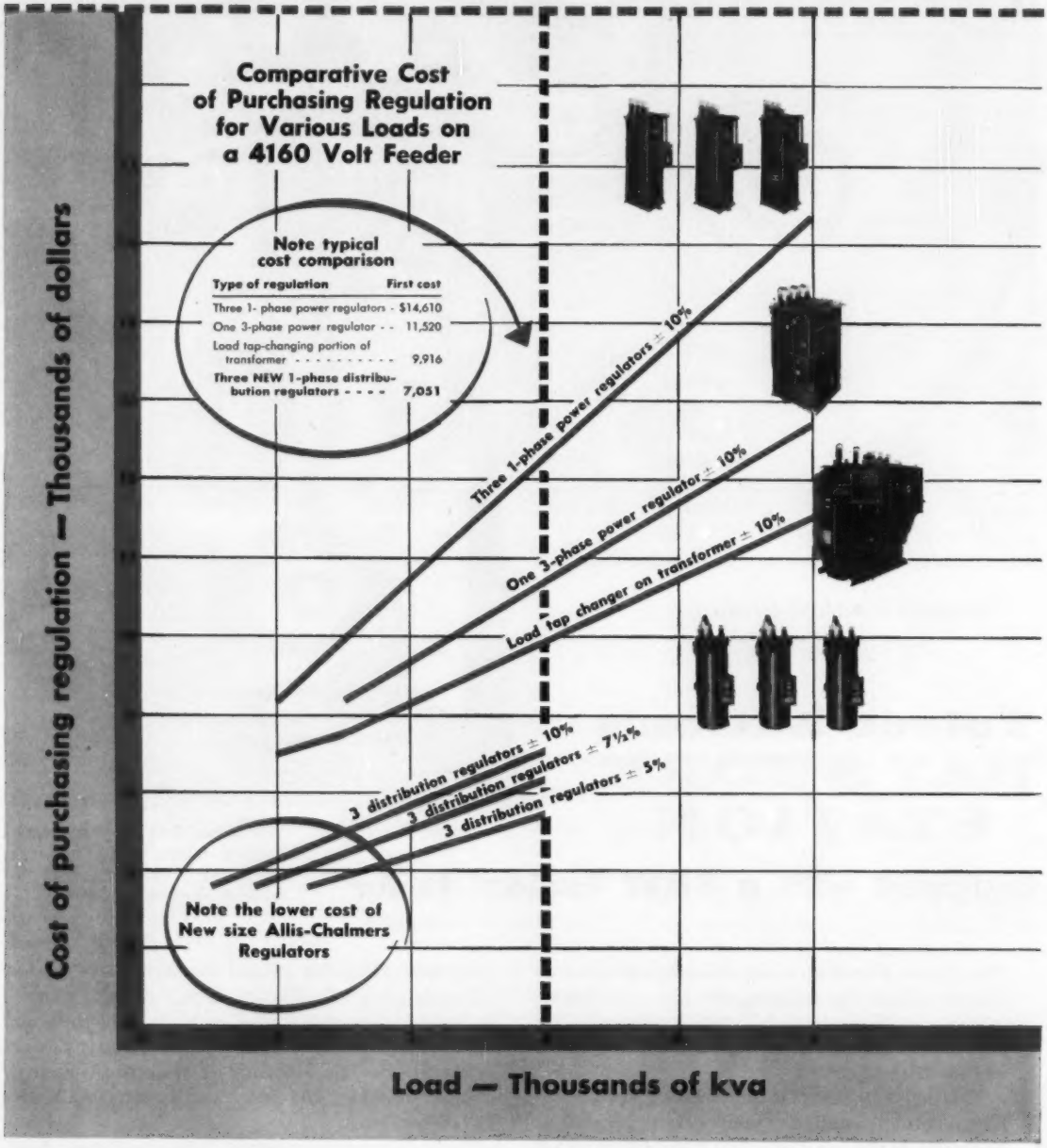
G-757

BABCOCK & WILCOX

BOILER DIVISION

Save 24% to 50% with..

Now Larger Units to Distribution Regulators instead of


Comparative Cost of Purchasing Regulation for Various Loads on a 4160 Volt Feeder
Note typical cost comparison
Type of regulation | First cost
Three 1- phase power regulators - $14,610
One 3-phase power regulator - - 11,520
Load tap-changing portion of transformer - - - - - - - - - - 9,916
Three NEW 1-phase distribution regulators - - - - 7,051
Three 1-phase power regulators ± 10%
One 3-phase power regulator ± 10%
Load tap changer on transformer ± 10%
3 distribution regulators ± 10%
3 distribution regulators ± 7½%
3 distribution regulators ± 5%
Note the lower cost of New size Allis-Chalmers Regulators
Cost of purchasing regulation — Thousands of dollars
Load — Thousands of kva

GET INFORMATION

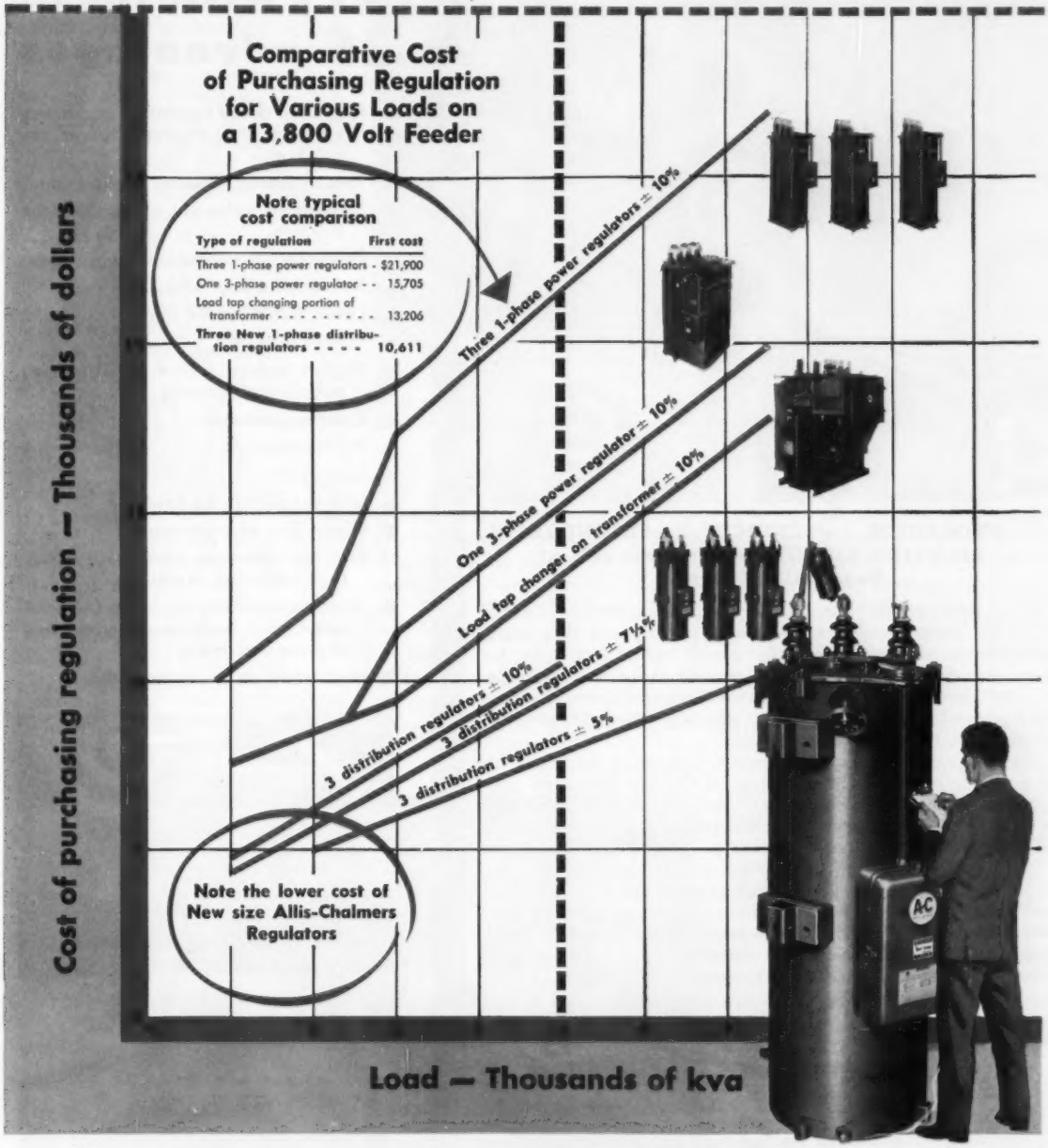
Call your nearest A-C office for complete story, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-5041

ALLIS-

...New Regulator Ratings

167 Kva Permit Use of Station Regulators or LTC Transformers


Comparative Cost of Purchasing Regulation for Various Loads on a 13,800 Volt Feeder
Note typical cost comparison
Type of regulation — First cost
Three 1-phase power regulators - $21,900
One 3-phase power regulator - - 15,705
Load tap changing portion of transformer - - - - - - - - - 13,206
Three New 1-phase distribution regulators - - - - 10,611
Three 1-phase power regulators ± 10%
One 3-phase power regulator ± 10%
Load tap changer on transformer ± 10%
3 distribution regulators ± 10%
3 distribution regulators ± 7½%
3 distribution regulators ± 5%
Note the lower cost of New size Allis-Chalmers Regulators
Cost of purchasing regulation — Thousands of dollars
Load — Thousands of kva

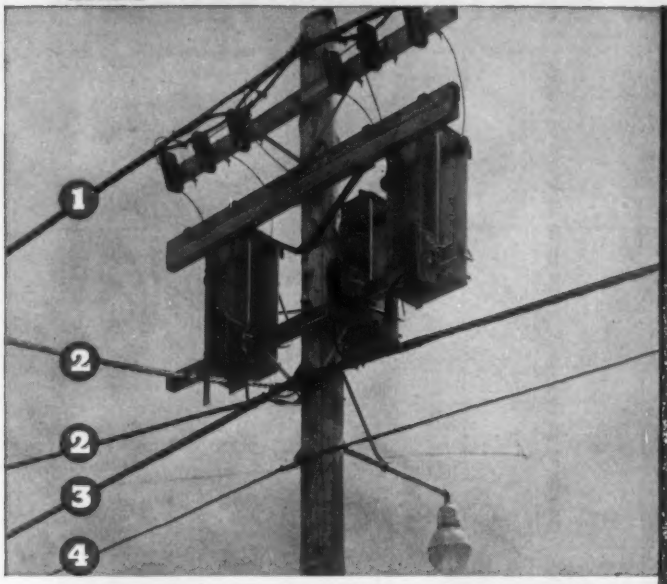
Check New Range of Ratings

VOLTS	AMP
14,400	50, 100
7,620	15, 25, 50, 75, 100, 150, 219
5,000	50, 100, 150, 200
2,500	100, 150, 200, 300, 400

CHALMERS

4 applications for OKOLITE-OKOPRENE *aerial cables*

. . . with these 16 advantages



1—PRIMARIES, 2—SERVICES, 3—SECONDARIES, 4—LIGHTING CIRCUITS—all on one pole at Bonneville, Oregon.

- Most utility engineers now recognize the advantages of aerial cables for primary circuits. Moreover, many are now using this economical cable design for street lighting circuits, for secondaries—including networks—as well as for service drops. For such installations, time-proved Okolite-Okoprene aerial cables—whether self-supporting, ring-supported or spinner-lashed—offer many advantages.

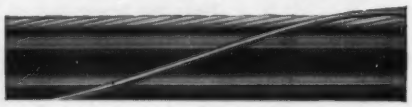
The patented Dualay* assembly, originally designed by Okonite engineers for hot-tapping of Okolite-Okoprene self-supporting primary cables, is also of distinct value for secondary circuits, since services can be taken off at any point, even in mid-span, without racks or spreaders.

In addition to their suitability for utility overhead systems, Okolite-Okoprene aerial cables are extensively used by industrial plants and railroads for power, lighting, communication and control systems. Details on the many types available, with complete data on selection and installation, are available in Bulletin EW-1074. The Okonite Company, Passaic, N. J.

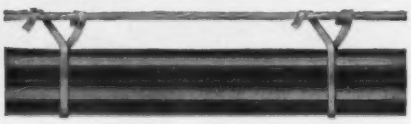
*Hot tap feature: in the Dualay method (U.S. Pat. 2,430,378) the insulated conductors are twisted together so that the direction of lay is reversed at regular short intervals to permit conductor separation without cutting the copper or performing any operation on the messenger.

- **Improved circuit regulation and lower voltage drop through lower reactance.**
- **Tree trimming reduced or eliminated.**
- **Overlength poles not needed to clear treetops.**
- **Fewer service interruptions or outages.**
- **Reasonable original cost.**
- **Lower maintenance cost.**
- **Simple to install.**
- **Higher safety factor for linemen, people and property.**
- **Good appearance.**
- **No festooning.**
- **Long spans.**
- **Less congestion on poles.**
- **Elimination of cross-arms.**
- **Reduced clearance space near buildings and other structures.**
- **Greater reliability in storms—resist wind, icing, moisture—operate even if poles are down.**
- **Messenger serves as neutral.**

Okolite-Okoprene *Self-Supporting* Aerial Cable with in-built messenger. Made with Dualay* design for easy tapping.



Okolite-Okoprene cables can be lashed to messenger by the *spinner method.*



Okolite-Okoprene cables may be installed in regular *messenger rings.*

Available with either copper or aluminum conductors

OKONITE OKONITE SINCE 1878 ***insulated cables***

3229

selves. News releases should emphasize benefits to the customers. And Robinson continued, utility executives must talk to customers on radio, television, and at meetings about what the company is doing to promote world peace, job security, prosperity, education, health, and safety. After a spirit of friendliness is built up, the public is ready to listen to your worries. Then you should ask for help.

"Top management generally tolerates the company magazine but fails to utilize it as an instrument of management," said C. B. Boulet, Wisconsin Public Service Corp. Failure to use this avenue of communication indicates failure in all communications.

From a study of 50 house organs Boulet said he found almost nothing about socialized power, fringe benefit plans, utility's virtual guaranteed annual work plan, profits, dividend increases, and what these mean to the employee.

Cost of serving air conditioning in an area having an air conditioning load factor of 15 to 20% annually could be covered by 2½¢ per kwhr for 1,500 kwhr per kw per year. After that the customer would purchase energy at 1½¢ per kwhr. This rate schedule was suggested by Edwin Vennard, Edison Electric Institute, as a means of giving a discount for and, thus, encouraging high annual load factors.

Member companies of the SEE have almost doubled their total installed generating capacity in the past five years. From 8.3 million kw it has grown to 15 million kw. This has been necessary to meet the growing demands of the area in which a half million more customers are expected this year, said W. J. Clapp, Florida Power Corp, and 1955-56 president of SEE.

One of the main reasons for this rapid growth is the influx of industry seeking to be near raw material, such as petroleum and wood, and to take advantage of the human resources including thousands of technical and professional graduates. Added to this is the expanding consumer market, in which the per capita income is four times that of 25 years ago.

NEW OFFICERS of Southeastern Electric Exchange include L. M. Smith, Alabama Power Co, first vice president; F. H. Coughlin, Central Louisiana Electric Co, third vice president; G. S. Dinwiddie, New Orleans Public Service, Inc., president; and G. L. Furr, Appalachian Electric Power Co, second vice president

"Top utility executives should give distribution problems . . . their personal attention," said J. H. Jewell, Westinghouse Electric Corp. The distribution system has been so neglected that it is approaching the inadequately wired home as a problem, and some major change is inevitable.

Jewell suggested that management direct engineers to study their distribution system and come up with long range answers. An EEI-NEMA joint committee should be appointed to do the same job for the whole industry. After evaluating the information the committee should recommend the best system. Attempts should then be made to standardize on one system.

Standardization of voltage, Jewell warned, must be guarded when thinking about future distribution systems. It contributed much to the growth of electrical appliances and has enabled users to move to any spot in the nation and be assured that his appliance will operate.

Progress of nuclear development in the United States is substantially ahead

H. H. YOUNG, Eastman Dillon & Co; Edwin Vennard, EEI; L. V. Sutton, Carolina Power & Light Co; and H. L. Hooker, State Corporation Commission of Virginia

C. B. BOULET, Wisconsin Public Service Corp; Kinsey M. Robinson, president, Washington Water Power Co; Walker L. Cisler, president, Detroit Edison Co

of any other nation, said W. L. Cisler, Detroit Edison Co. Because the nuclear program is so broad and proceeding rapidly, a crash program is not needed and would add little.

Reactors now planned or under construction will probably not generate power at a cost competitive with conventional methods, Cisler said. But experience gained should produce reactor designs within the next five or ten years that are competitive.

America no longer needs to wait for developments to keep growing, R. S. Stevenson, Allis-Chalmers Manufacturing Co, said. It can now do things by short cut through the research laboratory that once required elaborate testing. If we continue to follow this phylosophy, Stevenson predicted, it will bring the most fantastic and extreme advances ever seen.

H. H. Young, Eastman, Dillon & Co, predicted that interest rates on money will be about the same for some time. And, therefore, he cautioned utilities not to be in a rush in getting new capital. However, when executives plan financing, they should consider carefully the timing of new issues to avoid bunching up with other company offerings. Young said that plans of other companies can be obtained from Irving Trust Co. [Electrical World is planning to run this listing on a bi-weekly basis—Editor].

Young continued that now seems to be a good time to strengthen your financial structure and get the debt ratio down. When times are good, he said, the debt ratio should be 50% maximum with common-stock equity ratio of about 35%. If the company's equity ratio is above this, there should be a very good reason.

When utilities must provide service at miserly rates of return, the public and utility both suffer, said H. L. Hooker, State Corporation Commission of Virginia. Thus, rates should be increased if justified, regardless of public protest, because otherwise good service would be impaired.

Hooker also said that regulation must change with the economic system. And he continued, because it is the only successful and workable alternative to socialization, regulation must be understood by the public as well as supported by legislators. Selling regulation to the public is "a constant challenge to all those with the public interest at heart."

REA Co-ops Reveal Expansion Plans

Rural Electrification Administration borrowers plan a total of about $1 billion in new and improved power facilities over the next five years, the agency's latest survey shows.

The report indicates borrowers plan to spend $805 million during fiscal 1957-1961. But REA Administrator Ancher Nelsen said experience has shown five-year projections run about 20% under actual outlays. This would bring the total program to about $1 billion.

Borrowers plan to call on REA for $617 million in loans. Adding Nelsen's 20% brings the total amount of new loans to $800 million for the five year period.

Other results of the survey:

- In fiscal 1957, beginning this July 1, loans will run $141 million, spending $193 million.
- System improvements spending will soon account for 30% of construction expenditures. They now account for about 22%.
- New generation and transmission loans will reach one-third of loan volume soon. They now account for about 19% of loan dollar volume.

Anticipated Construction Outlays, By Type

	1957	*1958*	*1959*	*1960*	*1961*
Distribution	$83	$71	$61	$61	$58
System Improvement	57	50	56	45	45
Generation	34	46	26	16	35
Transmission	19	18	9	13	12
Total	$193	$185	$142	$135	$150

* Figures are in millions

MIT Sets Ceramic Study

A special two-week summer program on Theory and Practice of Ceramic Forming is being offered by the Massachusetts Institute of Technology July 16-27. The program will cover research, development control.

W. M. "Doc" Emmons, Southeastern Region
Switchgear Product Engineer, shows how to get . . .

Bigger Breakers Without Bigger Budgets

Air-conditioning load alone has required greatly increased system capacity in recent years. To gain necessary system protection, the Westinghouse Modernization Plan provides you with a quick and effective way of getting needed breaker capacity *now,* without putting your replacement budget into the red.

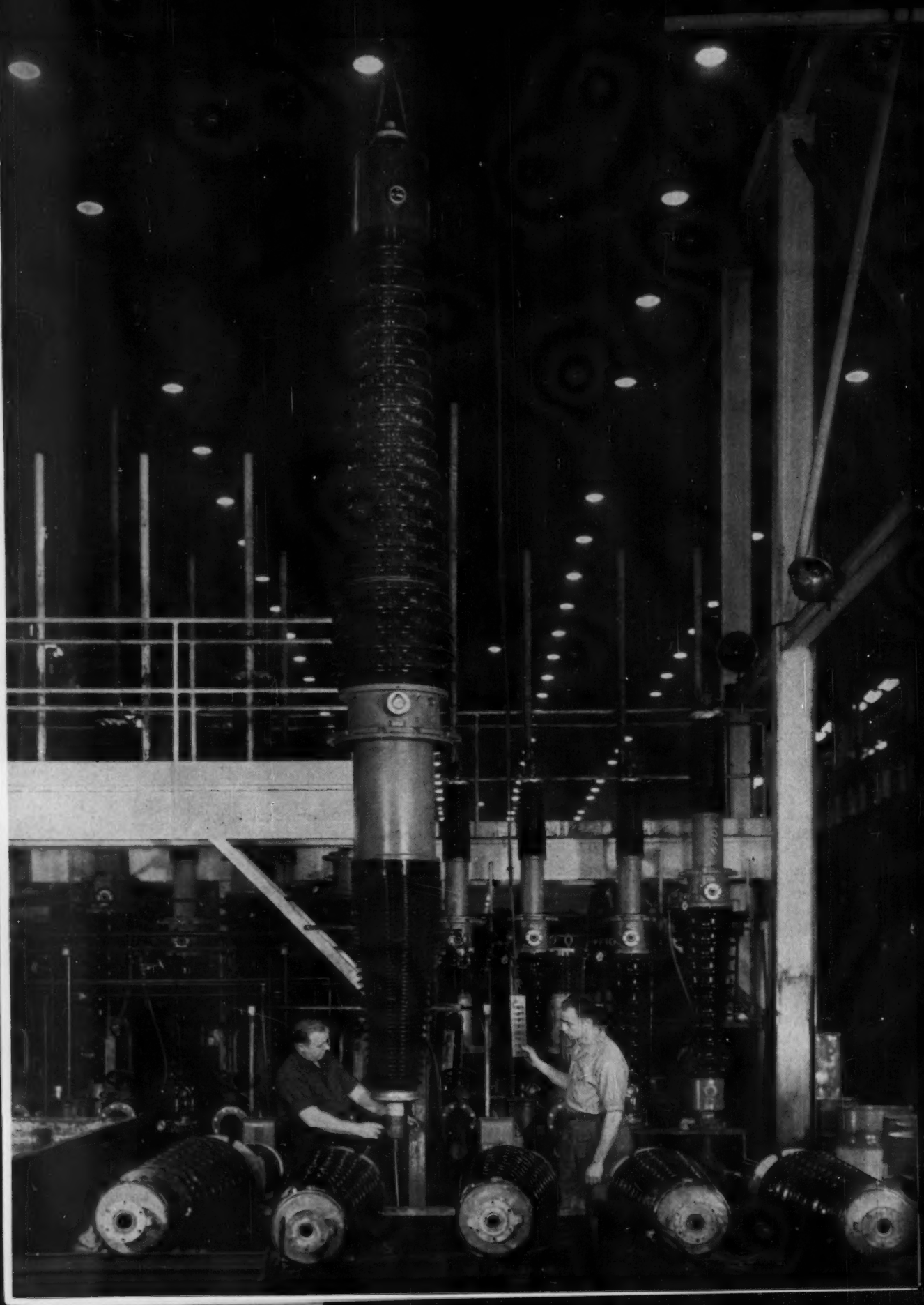
Let us know the style and rating of your present breakers. We can then supply new De-ion® grids, contact structures and other details as required to boost unit ratings 50 to 200% and add up to 15 years of useful life to your present Westinghouse O, G, GO or GM frame-mounted or floor-mounted breakers.

Breaker foundations need not be touched nor the tank remounted. Bushings and operating mechanism usually remain intact. The new De-ion grids you install will also incorporate all the maintenance-saving design advances older equipment cannot give you.

All in all, savings of up to two thirds the cost of complete new breakers can be realized with this plan. For full details get in touch with your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60880

YOU CAN BE SURE...IF IT'S

Westinghouse



Helping the industry meet its growing loads

Better Service Continuity From 50 Years of Condenser Bushing Research and Development

Long ago, Westinghouse realized that bushings on your transformers and breakers must be one of the strongest links in your system.

Over 50 years ago they designed the first bushings using the *condenser* principle to provide a smooth voltage gradient throughout the insulation. Continuous improvements since then plus developments such as vacuum oil impregnation and high-strength, one-piece porcelain have resulted in today's trouble-free Type "O" bushing which only Westinghouse can offer you.

The dependability of these *Type "O" condenser* bushings which assures service continuity to your customers has been proved by 38,650 bushings in the field which have given service exceeding 180,000 bushing years since 1942.

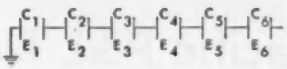
Another feature to provide both economy and ease of maintenance is the interchangeability of the Westinghouse bushings between transformers and breakers.

The same engineering leadership that developed this idea 50 years ago continues at Westinghouse today, searching out answers to your system problems . . . answers that, like the condenser bushing, will prove of greater and greater value to you as systems grow. J-97192

YOU CAN BE SURE...IF IT'S

Westinghouse

Type "O" Bushings . . . Trouble-Free Insulation



A series of equal capacity *condensers*, spaced concentrically around the conducting lead, provides uniform voltage stress not only throughout the insulation but also over the external surface. Oil impregnation under vacuum eliminates the possibility of voids in the insulation. This, together with the smooth *condenser* gradient, banishes internal corona with its resulting radio interference and insulation breakdown. The one-piece, high-strength porcelain is Westinghouse manufactured and engineered to coordinate with the bushing design.

At Ohio Valley Electric Company's Kyger Creek switchyard, these 330-kv, 25,000,000-kva circuit breakers are equipped with 330-kv Type "O" bushings as shown on the opposite page. For further details on Type "O" or Type "S" condenser bushings, call your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pa.

SG&E Elevates E. F. Graham to Executive VP

Edgar F. Graham, recently appointed vice president of all commercial and division activities for Southwestern Gas & Electric Co, has been promoted to executive vice president. Retiring from this post is N. P. Heath who remains on the company's board of directors.

Before his vice presidential appointment last fall, Graham was vice president and East Texas Division manager for eight years. During his association with SG&E, which began in 1925, he has been assistant to the executive vice president, rate department head, and assistant to the president. He has been a board member since 1941.

Heath, who devoted his entire business career to SG&E, joined the utility in 1914 as meter reader and trouble shooter. After his 1927 appointment as superintendent of power, he rose to vice president and Louisiana Division manager, executive vice president, and executive committee chairman of SG&E's board. The post of Louisiana Division manager, held by Heath at the time of his retirement, has been assigned to Robert F. Scott, assistant division manager since 1946.

EDGAR F. GRAHAM

Pacific P&L Names Torpen to Engineering Post

Bernhardt E. Torpen, special assistant to Brig Gen L. H. Foote, North Pacific Division engineer, Corps of Engineers, has left the federal service after 23 years to accept an engineering post with Pacific Power & Light Co.

In his new job he will work on hydroelectric projects such as the $58.7 million, 256,000-kw Swift project and the 74,000-kw Meadows development, both on the Lewis River; and others, including PP&L's partnership proposal for Bureau of Reclamation's Yellowtail Dam, Wyoming.

His engineering career with the Corps has included participation in design and construction of Bonneville, McNary, Chief Joseph, and other multipurpose dams on the Columbia River. During the current winter he served as consultant on flood control in the Punjab region of Pakistan and on the Ganges and Bhramaputra Rivers in India.

PP&L has also announced the appointments of William O. Brownson as administrative assistant to Vice Pres John Dierdorff, and Walter Eschebeck as training director.

BERNHARDT E. TORPEN

Harper Co Elects Channer VP

Newly appointed vice president in charge of sales for the H. M. Harper Co is E. A. Channer, formerly general sales manager of the company. He will continue in this capacity as vice president.

Channer has been associated with Harper since 1939, and served as district manager of the Cleveland office before his 1951 appointment as Eastern district sales manager. He was named to his most recent post of general sales manager two years later.

E. A. CHANNER

VICTOR PROGRESS REPORT 2

We make our own LIGHTNING to give you INSULATORS that last

Shown above is VICTOR'S 800,000-volt impulse generator in our modern electrical laboratory. This unit, together with VICTOR'S complete mechanical and electrical test facilities, enables our engineers to simulate the most extreme service conditions.

Included in this unit are a remote controlled gap spacing mechanism, an oscillograph for showing wave forms visibly on the screen of a cathode ray tube and a 4" x 5" camera for recording these waves on film for observation and study.

One more reason why VICTOR gives you insulators that last—that are design-tested to withstand lightning and other adverse service conditions. VICTOR'S modern plant, engineering and research facilities are unsurpassed in the field. You just can't buy better insulators!

"BETTER INSULATORS THROUGH RESEARCH"

SPECIFY VICTOR Purified Porcelain Insulators!

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain
Insulator Hardware

PERSONAL BRIEFS

H. A. Hitch and **W. I. Dolbeare,** both vice presidents of Virginia Electric & Power Co, have been appointed as members of the executive committee of the Public Utilities Association of the Virginias. They succeed the late **Jack G. Holtzclaw** and **M. C. Smith,** who retired early this year.

Clarence P. Komers, Montana Power Co customer service advisor at Havre, has been named to the newly-created position of supervisor of residential sales at Butte. He will be succeeded at Havre by **William E. Headapohl.**

Carolina Power & Light Co has promoted **W. R. Buchanan** from assistant superintendent of substations to superintendent of substations to replace **Paul S. Colby,** who becomes engineering consultant . . . In other company promotions, **Mendall H. Long,** Lumberton plant superintendent, succeeds **J. A. Jones** as superintendent of the Louis V. Sutton steam plant, and Jones becomes power plant engineer with offices in Raleigh. **J. H. Humphrey,** operating supervisor of the Lumberton plant, has been appointed Walters plant superintendent to succeed **E. J. Pearson,** new Lumberton plant superintendent.

Laurance F. Hemenway, Pennsylvania Power Co safety coordinator, has retired after almost 36 years with the company.

Jan Oostermeyer, former head of Shell Chemical Co, has been named president of the Association for Applied Solar Energy for the year. Other officers are **Walter T. Lucking,** president of Arizona Service Co, vice president, and **John I. Yellott,** an assistant director of Stanford Research Institute, secretary-treasurer.

Minnesota Mining & Manufacturing Co's Irvington Varnish and Insulator Division has designated **L. J. Timm** as product control head of its Coating Division. Timm will also continue his duties as quality control supervisor for Irvington.

Robertshaw-Fulton Controls Co's **George L. Ogdin, Jr,** has been promoted from assistant general sales manager to general sales manager of the Fulton Sylphon Division.

Richard F. Gibbons has been appointed general manager of the Gardner Transformer Division of Federal Pacific Electric Co. He was formerly manager of air switchgear engineering, Pacific Switchgear Division.

Organizational changes in Ansonia Wire & Cable Co's engineering department include **Hugo W. Biskeborn's** promotion from cable research engineer to chief engineer, and **Victor Siegfried's** appointment as power cable engineer. Siegfried was formerly chief research engineer of American Steel & Wire Co's electric cable works.

Appointment of **Colonel Wendell P. Trower** as assistant to the vice president has been announced by Kaiser Engineers Division of Henry J. Kaiser Co. He is former division engineer for the Great Lakes and North Central Divisions, Corps of Engineers.

Thomas K. Graham has been designated to succeed **Lorin W. Kemp** as manager of International Smelting & Refining Co's Raritan Copper Works. Kemp retires after 42 years service with the Anaconda Co subsidiary.

New chairman of the board of directors of Walter Kidde Nuclear Laboratories, Inc, is **Henry K. Norton,** former president.

General Electric Co has appointed **Joseph A. Whittaker** manager of product service, a new component in the medium steam turbine, generator and gear department's marketing section.

William Duffy has been named chief plant engineer of Stokes Molded Products Division of Electric Storage Battery Co.

OBITUARY

Raymond J. Trainor, 60, assistant treasurer of the Philadelphia Electric Co, died recently. He was associated with the utility for 40 years.

Harry A. Weitzman, 55, manager of Rochester Gas & Electric Co's rate and economic research department, died recently. He was a member of several committees of Edison Electric Institute and a member of the American Institute of Electrical Engineers.

Alcoa Slates New Plant with Ohio Valley Site

Another booster shot seems slated for the strong arm of the Ohio River Valley area with Aluminum Co of America's recent announcement of plans for a new 150,000-ton primary aluminum plant with probable location in the Ohio Valley. The proposal represents another step in the aluminum industry's return to coal-generated power instead of hydro.

Following on the heels of multimillion dollar Valley plans reported by three other aluminum firms, Alcoa's plant would take the big share of a $150-million budget and increase its primary aluminum capacity about 20%. Construction will start late this year or early 1957.

Other aluminum plants already begun or definitely set for the Ohio Valley are these:

Olin Mathieson Chemical Corp, in conjunction with Ohio Power Co, an American Gas & Electric Co subsidiary, and Pittsburgh Consolidation Coal Co., plans an integrated plant which will cost $170 million (EW, Jan. 30, p 9).

A $120-million reduction plant, begun by Kaiser Aluminum & Chemical Corp at Ravenswood, W. Va., will have an output of 220,000 tons (EW, Dec. 12, 1955, p 88).

Reynolds Metals Co also has started construction of its 100,000-ton plant in the Valley.

Lorain-Medina REA Unit Conducts Customer Query

Lorain-Medina Rural Electric Cooperative, Inc, recently conducted a public relations survey of customers in its area to determine public opinion on such questions as "Are cooperatives desirable?" and "Is good service provided?"

Replies to the Wellington, Ohio, co-op questionnaire indicated that 20% of the non-members and 6% of members considered co-ops undesirable; 11% of the non-members and 5% of the members felt they received inadequate service; and 25% of nonmembers and 22% of members believed co-ops were subsidized.

In addition, over 74% of the members believed co-ops pay their fair share of taxes while 40% of the nonmembers took the opposite view.

LOW VOLTAGE SWITCHGEAR through 600 v a-c, 250 v d-c, 15,000 through 150,000 amp interrupting, 6000 amp continuous.

UNIT SUBSTATIONS—primary and secondary, indoor and outdoor construction—in all standard ratings, dry, askarel or oil transformers.

ISOLATED PHASE BUS through 138 kv and 10,000 amp.

METAL-CLAD SWITCHGEAR in ratings from 2400 v through 15 kv, 50 through 500 mva interrupting and 2000 amp continuous.

INDIVIDUAL BREAKERS, a-c and d-c, 15,000 through 150,000 amp interrupting, 6000 amp continuous.

NONSEGREGATED PHASE BUS through 15 kv and 6000 amp.

Economical: an I-T-E Power Package

An I-T-E Power Package includes the complete power handling facilities for a new construction project, building addition, or expansion of electrical service—one unit or a complete system for every application from generation to end use. You save in sound planning, easier installation, coordinated delivery, and assured performance—a better investment in every way.

For more information, contact the I-T-E sales office nearest you or write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY
Switchgear Division

I-T-E

MEETINGS CALENDAR

APRIL

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Eighth Conference on Electrical Engineering in the Rubber and Plastics Industries, Mayflower Hotel, Akron, Ohio, April 9-10; Great Lakes District, Fort Wayne, Ind., April 16-18; Technical Conference, Bradford Hotel, Boston, Mass., April 26-27.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION—Engineering & Operation Section, Hotel Vancouver, Vancouver, B. C., April 11-13.

NORTHWEST PUBLIC POWER ASSOCIATION, INC—Annual Membership Meeting, Ridpath Hotel, Spokane, Washington, April 11-13.

SOUTHEASTERN ELECTRIC EXCHANGE—Engineering & Operation Section, Bon Air Hotel, Augusta, Ga., April 12-13.

EDISON ELECTRIC INSTITUTE—Advisory and Executive Committees, Hotel Commodore, New York, N. Y., April 16; National Conference of Electric & Gas Utility Accountants, sponsored jointly with AGA, Hotel Commodore, April 16-18; Industrial Relations Committee, EEI Headquarters, N. Y. C., April 19; Engineering Committees, Edgewater Beach Hotel, Chicago, April 30-May 2.

ATOMIC INDUSTRIAL FORUM, INC—Atomic Energy Conference, Atlantic-Biltmore Hotel, Atlanta, Ga., & Oak Ridge, April 17-18.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Engineering Conference, Hotel President, Kansas City, Mo., April 18-20.

PACIFIC COAST ELECTRICAL ASSOCIATION—Administrative Services Section, Huntington-Sheraton Hotel, Pasadena, Calif., April 18-20.

PENNSYLVANIA ELECTRIC ASSOCIATION—Meter Committee, Roosevelt Hotel, Pittsburgh, Pa., April 19-20.

PROTECTIVE RELAY ENGINEERS—Ninth Annual Conference, Department of Electrical Engineering, Agriculture and Mechanical College of Texas, College Station, April 23-25.

ROCKY MOUNTAIN ELECTRICAL LEAGUE—Spring Meeting, Shirley-Savoy Hotel, Denver, Colo., April 29-May 1.

MAY

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—North Eastern District Meeting, Rochester, New York, May 2-4.

EDISON ELECTRIC INSTITUTE—Accident Prevention Committee, Coronado Hotel, St. Louis, Mo., May 2-4; Purchasing & Stores Committee, Sheraton Plaza Hotel, Boston, Mass., May 7-9; Commercial Electric Cooking Conference, Sheraton Hotel, Chicago, Ill., May 8; Transportation Committee, jointly with AGA, Congress Hotel, Chicago, May 8-11; Industrial Relations Committee, Willis E. Hughes Memorial, Rochester, N. Y., May 17; Orientation Meeting, jointly with AGA, Headquarters, New York, N. Y., May 21.

NATIONAL FARM ELECTRIFICATION CONFERENCE—LaSalle Hotel, Chicago, Ill., May 3-4.

PENNSYLVANIA ELECTRIC ASSOCIATION—Hydraulic Power Committee, Hotel Warwick, Philadelphia, Pa., May 3-4; Transmission and Distribution Committee, Skytop Lodge, Skytop, Pa., May 10-11; Communications Committee, Nittany Lion Inn, State College, Pa., May 14-15; Relay and Electrical Equipment Committees, Hotel Roosevelt, Pittsburgh, May 17-18; Systems Operations Committee, Bedford Springs Hotel, Bedford, Pa., May 24-25.

NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS—Executive Committee, Leamington Hotel, Minneapolis, Minn., May 4.

ATOMIC INDUSTRIAL FORUM, INC—Hotel Plaza, San Antonio, Texas, May 10-11.

NORTHWEST PUBLIC POWER ASSOCIATION, INC—Engineering & Operations Section, Cascadian Hotel, Wenatchee, Washington, May 10-11.

PUBLIC UTILITIES ADVERTISING ASSOCIATION—Annual Convention, Warwick Hotel, Philadelphia, Pa., May 10-11.

INTERSTATE POWER CLUB—Hotel Martinique, N. Y. C., May 14.

PACIFIC COAST ELECTRICAL ASSOCIATION—Annual Convention, Las Vegas, Nevada, May 14-16.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Design Engineering Conference, Convention Hall, Philadelphia, Pennsylvania, May 14-17.

ILLINOIS INSTITUTE OF TECHNOLOGY—Industrial Nuclear Technology Conference, Museum of Science & Industry, Chicago, Ill., May 15-16.

GREAT LAKES POWER CLUB—Wagon Wheel Hotel, Rockton, Ill., May 17-18.

NEW YORK STATE SOCIETY OF PROFESSIONAL ENGINEERS—30th Engineering Industries Exposition with Annual Convention, Statler Hotel, New York City, May 17-19.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION—Business Developments Section, Benjamin Franklin Hotel, Seattle, Wash., May 21-23.

AMERICAN MANAGEMENT ASSOCIATION—General Management Conference, Hotel Roosevelt, New York City, May 23-25.

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS—Annual Meeting, Ambassador Hotel, Atlantic City, New Jersey, May 23-26.

CIGRE—16th Annual International Conference, Paris, France, May 30-June 9.

JUNE

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS—52nd Annual Meeting, Sheraton-Gibson Hotel, Cincinnati, Ohio, June 4-6.

EDISON ELECTRIC INSTITUTE—24th Annual Convention, Traymore Hotel, Atlantic City, June 4-6.

AMERICAN SOCIETY OF CIVIL ENGINEERS—National Spring Meeting, Knoxville, Tenn., June 4-8.

NATIONAL ASSOCIATION OF ELECTRICAL DISTRIBUTORS—48th Annual Convention, Ambassador & Chelsea Hotels, Atlantic City, N. J., June 11-14.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Semi-Annual Meeting, Statler Hotel, Cleveland, Ohio, June 17-21.

AMERICAN SOCIETY OF TESTING MATERIALS—59th Annual Meeting & 12th Apparatus Exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J., June 17-22.

FIFTH WORLD POWER CONFERENCE—Vienna, Austria, June 17-23.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION—Accounting & Business Practice Section, Multnomah Hotel, Portland, Oregon, June 21-23.

PUBLIC UTILITIES ASSOCIATION OF THE VIRGINIAS—Accident Prevention Committee Conference, Hotel Roanoke, Roanoke, Va., June 22.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Summer and Pacific General Meetings, Fairmont Hotel, San Francisco, California, June 25-29.

AMERICAN SOCIETY FOR ENGINEERING EDUCATION—Annual Meeting, Iowa State College, Ames, Iowa, June 25-29.

AMERICAN CHIEF ENGINEERS ASSOCIATION—Northwest Power Show, Minneapolis Auditorium, Minneapolis, Minnesota, June 28-July 1.

JULY

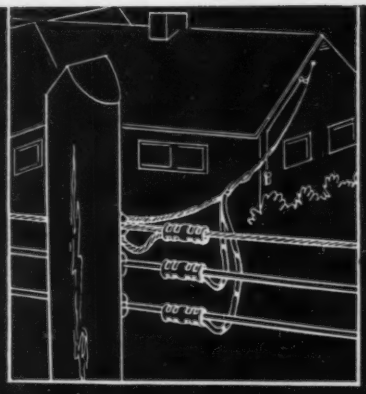
* **INTERNATIONAL ORGANIZATION FOR STANDARDIZATION**—Council Meeting, Geneva, Switzerland, July 16-21.

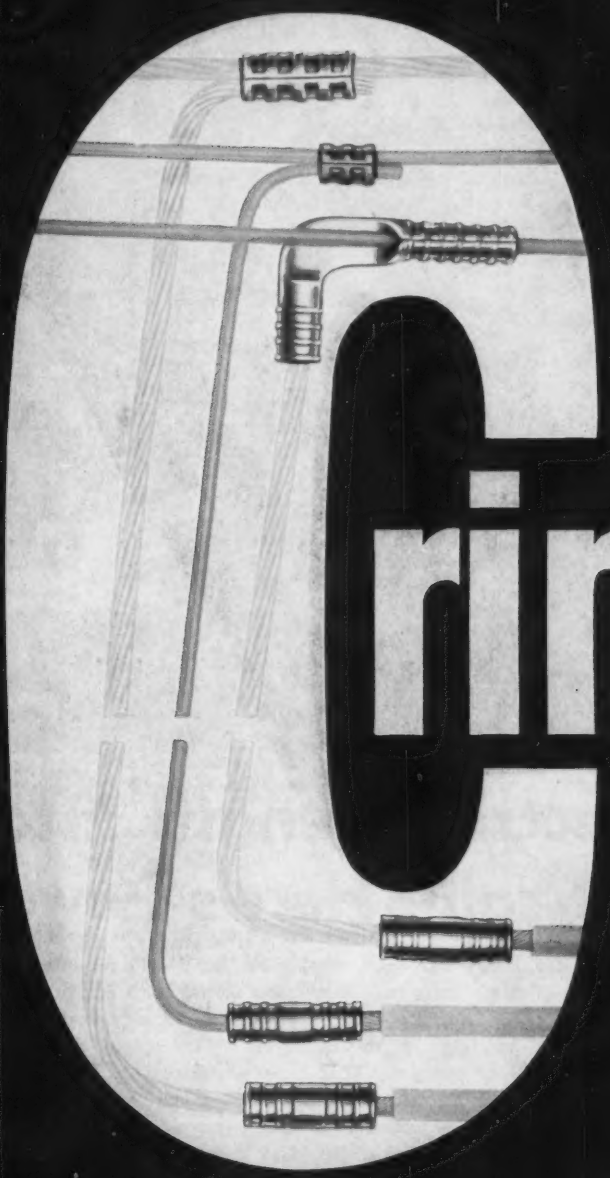
* **NATIONAL ASSOCIATION OF RAILROAD UTILITIES COMMISSIONERS**—Annual Convention, Sheraton Palace Hotel, San Francisco, Calif., July 24-27.

* **COLUMBIA UNIVERSITY INDUSTRIAL & MANAGEMENT ENGINEERING DEPARTMENT**—Fifth Annual Utility Management Workshop, Arden House, Harriman, New York, July 29-Aug. 10.

* Additions this week.

Do the job better!





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LESS COST...
with

Crimpit

TOOL-CONTROLLED CONNECTIONS

One hand or hydraulic tool... minimum die investment...and low-cost Crimpit line connectors will make every service connection from pole to house. Write for Crimpit bulletin.

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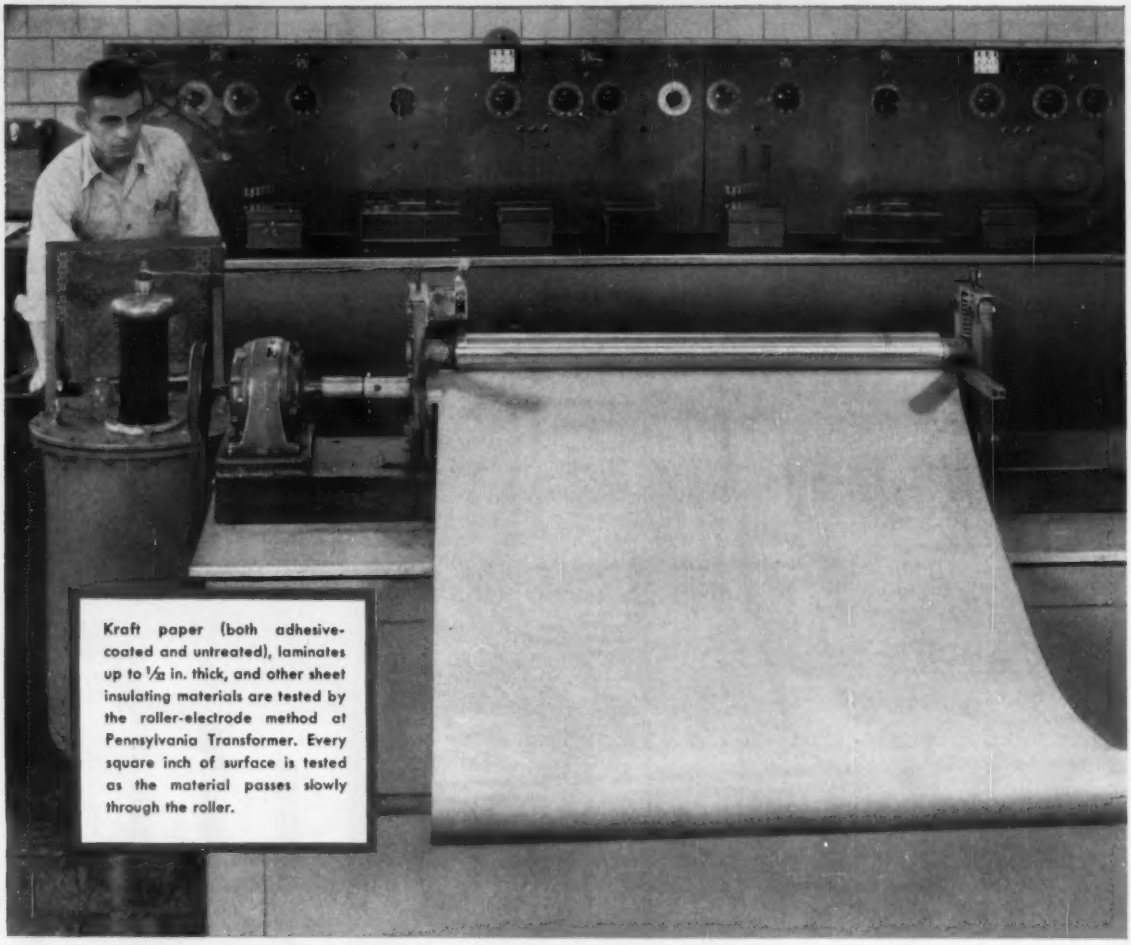
Norwalk, Connect. • Toronto, Canada • Factories: New York, California, Toronto • Export: Philips Export Company



Kraft paper (both adhesive-coated and untreated), laminates up to ½ in. thick, and other sheet insulating materials are tested by the roller-electrode method at Pennsylvania Transformer. Every square inch of surface is tested as the material passes slowly through the roller.

He's rolling dielectric strength into your POLE STAR coil—Here's how...

Unlike other insulation testing methods in wide use today, the roller-electrode test introduced by Pennsylvania assures accurate testing of every square inch of material. Voltage applied through the upper roll (the lower roll is grounded) converts the harmless-looking device pictured into a torture rack that is *certain* to reveal any existing weak spots — whether blisters, pin holes, inclusions of foreign matter, or some other defect in the material.

The roller-electrode test measures dielectric strength of insulation in the industry-approved units of volts-per-mil — that is, the amount of voltage that a particular thickness of a given insulating material is capable of taking without a breakdown. Rigid volts-per-mil minimum standards have been set up for insulating materials that go into Pole Star distribution transformers, and thorough testing by the roller electrode method is your guarantee that these standards are being met. Each insulation manufacturer's material must pass acceptance tests before being approved for Pole Star insulation, after which batch checks keep the quality of the material under constant surveillance.

POLE STAR pt

167 Production Controls make POLE STARS best!

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** *Greater Pittsburgh District*

Pole Star Transformers are available in all standard single phase distribution sizes from 3 through 500 kva, through 67,000 volts.

At American Power Conference . . .

Vogel Qualifies TVA 'Yardstick'

Says low power costs are due to inherent advantages in region as well as to tax, interest, and profit factors

H. D. VOGEL, TVA, is congratulated by AIEE Pres M. D. Hooven. R. B. Geare, Commonwealth Edison, watches

"A number of factors, aside from taxes, interest, and profit, are favorable to low power costs in the Tennessee Valley region . . . In all fairness these result in consumer advantages not enjoyed by customers of private power companies. Any talk about establishing a measure for the cost of power without reference to these factors is . . . absurd."

This qualification of the TVA "yardstick" was made by Brig Gen Herbert D. Vogel, TVA chairman, before the American Power Conference at Chicago, March 21-23.

TVA payments in lieu of state and local taxes, he said, are comparable to non-federal taxes imposed upon 12 adjacent utilities, and its 4% earnings exceed the cost of investment money. All proposals before Congress, he added, require interest payments and make TVA bonds subject to federal taxes.

The TVA system, he pointed out, enjoys such inherent advantages as hydroelectric resources, coal, and water for cooling and cheap transportation of fuel. Construction of dams and hydro plants, completed during a low-cost period, he said, benefited by savings from the multi-purpose program. Steam plants benefited by modern technology which attains economy and efficiency by use of large units in large plants. High load factor promotes economical plant utilization.

Hoover Task Force Member Speaks

"It is time that we get the power business down to the local level where competitive factors and . . . fair play will determine the outcome . . . between public and private interests," countered John Jirgal, chairman of Group on Power Generation and Distribution, 2nd Hoover Commission. "The federal government has no right to choose which it should favor."

His task group, he said, has proposed:

1. Constructing hydro facilities associated with multi-purpose federal projects by local interests, public or private.

2. Eliminating steam plant and transmission construction by the federal government.

3. Selling or leasing existing federal power facilities to local interests subject to income taxes.

4. Modifying the preference policy to make federal power available to all parties on equal terms.

5. Setting power rates to cover all costs including taxes and interest under FPC jurisdiction.

6. Prohibiting long-term contracts implying federal obligation to meet regional demands.

7. Applying similar principles to nuclear power.

Federal control of power, Jirgal suggested, is subject to the same objections as holding companies. He urged utility managements to follow sound, long-range programs based on balanced financing to supply power at rates "as low as consistent with fair return."

There is political pressure from those who believe that all power developments growing out of natural resources, particularly hydro power and atomic energy, should be federally constructed, owned, and operated, Undersecretary of Interior Clarence A. Davis declared. Capital requirements for future power supply will be an estimated $50-billion in the next 10 years, this figure indicating the magnitude of the burden to be imposed on taxpayers. Unless these federal activities are limited, the national budget will be perpetually unbalanced, and inflation will continue.

Branch Opposes Federal Power

The big question this year is whether there will be a vigorous demand to eradicate subsidies to 20% of power consumers at the expense of 80% served by investor-owned utilities, said Harllee Branch, Jr, president, Edison Electric Institute and Georgia Power Co.

The industry's most pressing problem is how to halt encroachment by subsidized power groups which have invaded both political parties to perpetuate their program, he warned, noting such threatening inroads as:

1. The Lehman plan for state development of Niagara.

2. Repudiation of the Dixon-Yates contract.

3. Failure to press the "partnership program" for local construction of federal hydro projects.

4. Support of co-ops and preference customers in the Clark Hill case.

5. Proposals that the government build nuclear plants and sell their output to preference groups.

6. Proposals to finance TVA and REA from bonds or other securities to nullify Congressional control.

7. Failure to set sound SPA power rates.

An industry increasingly modernizing to make its service indispensable while steadily cutting its charges should be treated kindly by national legislators and administrators, Branch said, particularly when it pays nearly 25% of its income to support federal, state, and local governments. Instead it finds itself under political attack which will cease only when a majority of citizens demand it of both political parties.

(*American Power Conference continued on page* 46)

Leads of 48-inch 600-volt #12 wire furnished as standard equipment.

Bushing-Mounted Indicating Fuse with 48-inch lead can be supplied.

Solder-Sealed Bushings of strong one-piece wet-process porcelain provide a positive, lasting seal.

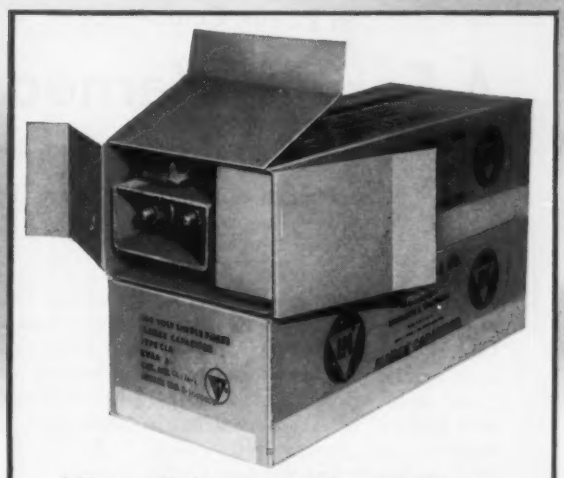
Pole-Mounting Bracket has two 9/16″ holes for ½″ lag screws. Standard EEI-NEMA crossarm-mounting bracket furnished if required. Capacitor can be mounted with bushings up or down.

Aluminum Metallizing process protects steel tank from oxidation; is followed by a chromate primer and a finish coat of alkyd resin paint.

Single-Pack, Round-Tank Design makes these capacitors small, light, easy to install. Unit has a one-minute discharge resistor; is completely impregnated under vacuum with low temperature Elemex liquid dielectric.

LM® LINE MATERIAL

L-M's 7½ kvar capacitor is 23½" high and weighs only 33 lbs. The 5 kvar is 18⅜" high, weighs 25 lbs. The 3 kvar is 13¾" high, weighs 18 lbs. Weights include pole-mounting brackets. Standard EEI-NEMA crossarm-mounting bracket furnished if desired.



L-M's unique shipping carton permits inspecting and testing capacitors without removing them from the carton, simply by opening the end flap—which can be resealed.

Small, Light, Easy to Install . . .

L-M's New Secondary Capacitors Provide Needed Vars For Air-Conditioning Loads

Solder-sealed bushings, aluminum metallized finish on tank, and single-pack construction assure long life, low maintenance.

By **BLAINE SCHULTZ**
Chief Engineer
Capacitors
Line Material Company

L-M's new secondary capacitor is your solution to the problem of poor voltage regulation and overloaded transformers caused by low-power-factor air-conditioning loads.

The unit is small, light, and rugged; easy to install on crossarm or direct pole mounting. It offers you outstanding design features, such as aluminum metallized tanks, solder-sealed bushings, one-minute discharge resistor, single-pack round-tank construction, and low-temperature Elemex liquid dielectric.

Protective Coating

L-M's unique aluminum metallizing process prevents oxidation of the steel tank and greatly extends the life of the capacitor. This process is followed by a chromate primer and a finish coat of alkyd resin paint. The finish coat is dark in color to facilitate heat radiation and keep the capacitor at low operating temperatures.

Solder-Sealed Bushings

Strong solder-sealed bushings of one-piece wet-process porcelain provide a positive, lasting seal. By eliminating gaskets and clamps we eliminate leakage. Therefore the capacitor can be mounted with bushings up or down.

Pack Construction

The packs are assembled in air-conditioned rooms to assure uniformity and are tested with over-voltage to eliminate any actual or potential defects. The units have a one-minute discharge resistor to assure safe handling and storage.

L-M's new 240-volt, pole-mounted, secondary capacitors are available in 3, 5 and 7½ kvar. 48-inch leads are furnished and external bushing-mounted indicating fuses can be supplied when required.

Ask us for complete information

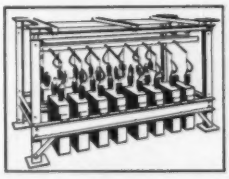
Ask the L-M Field Engineer for complete information on construction and application of L-M's secondary pole-mounted and submersible capacitor equipments, 2400- to 13,800-volt 15, 25, and 50 kvar capacitors, and our capacitor bank engineering service. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Elemex® Capacitors

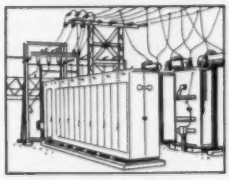
235-R

Other L-M Capacitor Equipments

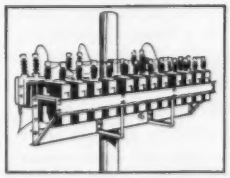
L-M offers a complete line of power capacitor equipments, such as these:



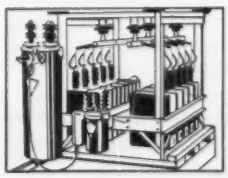
Factory-assembled blocks, which save time and money in building large banks.



Metal-enclosed capacitor equipments in all NEMA-standard sizes and ratings.



Factory-assembled racks for pole-mounted banks, both three-row and single-row styles.



VDS-Method factory-assembled block for multi-step bank switching—an exclusive L-M method that offers a substantial saving on switching equipment.

Also custom-designed protective and switching schemes.

At American Power Conference . . .

A-Forum Warned on Russian Gains

- **Soviets will have ten experimental reactors totaling 2,000 Mw by 1960**
- **American nuclear capacity will be only 750 Mw by the same date**
- **Four problems must be solved to make nuclear power competitive**

Although American industry has responded well to the Atomic Energy Commission's program for power reactor development, the program must move more vigorously to compete with Russia's. W. Kenneth Davis, director of AEC's Reactor Development Division, issued this warning at the Nuclear Energy Forum conducted as part of the American Power Conference. The forum brought together key men of government, manufacturing, and insurance.

Russian A-Plant Ready in '57

The Russians, he said, plan to complete in 1957 a 100,000-kw nuclear plant, using two light-water-cooled, graphite-moderated reactors. They also aim to complete ten experimental reactors of 100,000 to 500,000 kw each for upwards of 2,000 Mw by 1960.

More Leadership Needed Here

Urging more leadership in power reactor technology here, Davis said that expenditures in this field before start of the formal program reach $21 million. Current plans will add $282 million by about 1959. This year's major developments will include completion of the second homogeneous reactor and a sodium reactor. The organic-moderated reactor, boiling-water reactor, PWR, and Army Package Power reactor will operate in 1957.

Government Must Aid Industry

Government financial assistance must continue on a broad and reasonable basis to public and private utilities, Davis said. Major financial and technical, responsibilities, he added, must go to builders to give them incentive to cut cost for commercial use. Plants under construction or projected, he summed up, will bring American nuclear capacity to about 750 Mw by 1960.

Urging chemical company participation in the program, AEC's Dr Willard F. Libby indicated ways in which chemical manufacturers might cooperate and use the atomic byproducts of power production.

Making nuclear power competitive, he said, hinges on the solution of these problems:

1. Development of technology for economy in reactor design.

2. Overcoming cladding costs for heterogeneous fuel. (Continuous processing of homogeneous fuel offers a solution).

3. Controlling corrosion of reactor containers and components (Solution would enable homogeneous reactors to be used for power).

4. Training sufficient personnel to advance the program more rapidly (Adult education of practicing engineers in industry offers relief).

Appropriation of 40,000 kg of U^{235} would provide fuel for several million kw, continued Libby. The break-even point, he said, is more easily reached abroad which makes an attractive export market for reactors. Loss of this foreign market to Russia would be catastrophic, he warned.

How Progress Can Be Hurried

Francis K. McCune, General Electric Co vice president, citing the "real challenge" in building a true free enterprise business in the atomic field, said that progress could be accelerated by the following:

1. Participating in work of Joint Congressional Committee on Atomic Energy.

2. Accelerating research by industry to develop marketable products.

3. Investing private capital to establish competition in atomic business.

Most nuclear power problems are in the yet unexplored fringes of the engineering field, according to Dr Chauncey Starr, North American Aviation vice president. Experience with nuclear plant problems, he said, will enable equipment manufacturers to cut costs closer to those of conventional plants although radiation hazards may perpetuate higher maintenance and supervision costs. Significant factors are fuel element fabrication, utilization of fuel, and chemical reprocessing.

Research Classified in Importance

Appraising research and development to establish a suitable division of effort, Starr's proposal was one half on fuel and reactor metallurgy; one third on engineering, development, and testing of components; and one sixth on nuclear physics. As nuclear fission has no inherent temperature limit, he said, long-term programs should seek construction materials to permit very high operating temperature, with good prospects of utilizing gas turbine cycles. He conceded that little progress has been made toward direct conversion of atomic energy to electric power.

Insurance Needs Unprecedented

Insurance is pioneering in nuclear power, declared Charles J. Haugh, Travellers Insurance Co vice president, but potential hazards of toxic fuel, poisonous fission products, and possible explosion of the reactor prompt demands for insurance in amounts never before requested. Nevertheless a syndicate of stock companies, he said, expects to offer $50 million of property insurance for each separate reactor and a like amount of liability insurance.

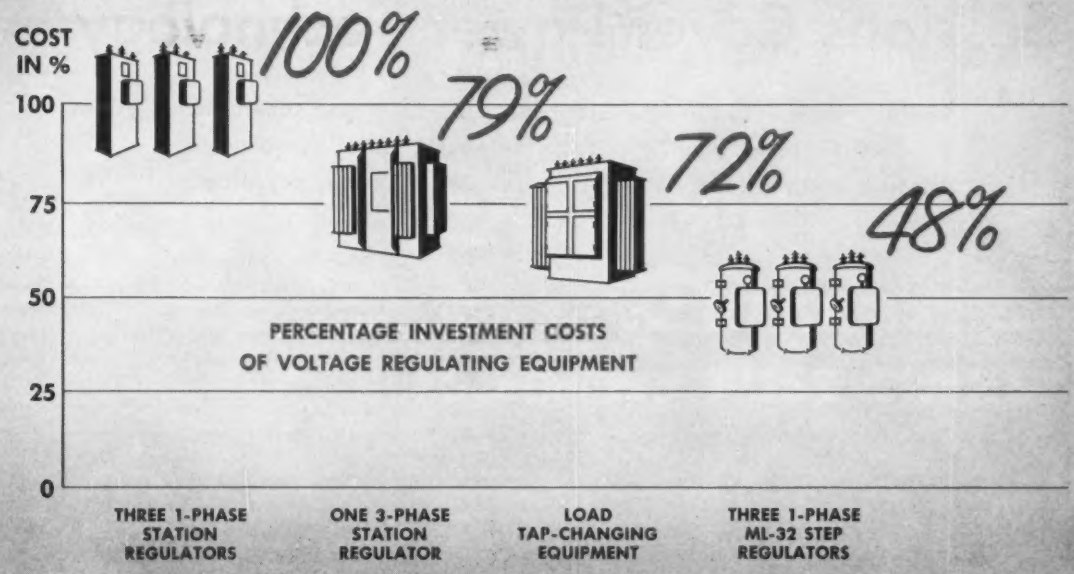
Conditions Will Set Premiums

Additional insurance, possibly as much as $15 million per reactor, is planned by a mutual company group Haugh added. Premiums for both insurance plans will be determined by a survey of each installation. Considerations will include location, proximity to water sheds and populated areas, reactor type and power level, containment, and normal meteorological conditions in the area in which the plant is located.

(*APC continued on page* 48)

VOLTAGE REGULATORS

Profitable voltage regulation to help solve your distribution problems



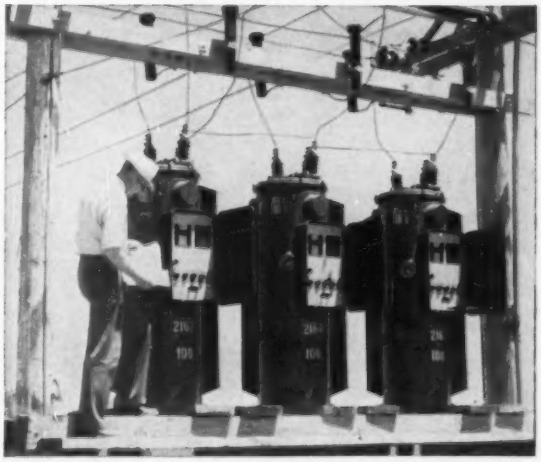
Cost comparison shows ML-32 voltage regulators REDUCE REGULATOR INVESTMENT 50%

With new higher KVA ratings and increased current-carrying capacity now available, General Electric pole-type, single-phase Type ML-32 step voltage regulators make possible low-cost regulation in a wide range of applications, including substations as large as 8000 kva.

Compared with more expensive equipment, they can cut the cost of efficient regulation by more than 50 percent, as shown in the chart above. (This representative illustration compares the approximate relative costs of regulating a typical 3000 kva, 4 kv substation.)

Increased opportunities are thus offered to utilities not only to extend the use of voltage regulation, but also to benefit from increased revenues and savings through deferred investment in line rebuilding.

General Electric ML-32 regulators offer ±10% regulation in thirty-two 5/8% steps, in all standard voltage classes for circuits up to and including 14.4/24.9 kv. In addition, when installed on lines requiring only ±5% regulation, the G-E ML-32 step regulator will comfortably carry 160% of rated current (to a maximum of 400 amperes). For information on ratings and applications, get in touch with your local General Electric Apparatus Sales representative, or write for publication GER-1154 to Section 423-11, General Electric Company, Schenectady 5, N. Y.



ONLY THE ML-32 REGULATOR gives you ALL the most advanced features—including Class 1 control accuracy, control dial locking, "Bounce-free" Opti-life switching for increased contact life, up to 120 seconds time delay, internal by-pass protection and many other advantages. They add up to the most efficient, economical regulator of its type available today!

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At American Power Conference . . .

Sessions Cover Power Technology

- **Water conditions play important part in nuclear and supercritical designs**
- **Generator replacement hinges on determination of economic time**
- **Battle over secondary voltage develops split in utility acceptance**

Power gave the United States its edge over the rest of the world, R. S. Stevenson, president, Allis-Chalmers Mfg Co, told the American Power Conference in Chicago, March 21-23. Technology, so important in the development of our power facilities, has benefited from a favorable political atmosphere.

Stevenson noted that Allis-Chalmers is starting a pilot program to provide educators with material to stimulate children's interest in what makes our power economy click. Every presidential candidate in 1956, he said, should sponsor the maintenance of the "power" economy.

Nuclear energy for electric power production has employed the fission process used in the A-bomb, said Dr John T. Rettaliata, president, Illinois Institute of Technology. He declared that although engineers and scientists constitute less than ½ % of population, the nation relies on them to police security and advance living standards.

Argonne National Laboratory's new 5,000-kw boiling-water reactor power plant will have a cylindrical reactor vessel 84-in. diam and 23-ft high, said Alf Kolflat, Sargent & Lundy. His paper, presented by H. C. Schroeder, described how the plant will operate at 600 psig.

Nuclear Progress Involves Fuel and Water

Main obstacle to power reactor progress is development of a reliable fuel element, said W. D. Shepherd, Westinghouse Electric Corp, in presenting a paper by E. T. Morris. All atomic study groups, he said, are engaged on this problem.

H. E. Grantz and M. C. Compton, General Electric Co, described features of a 10,000-kw nuclear plant now for sale. Overall efficiency is 26%, and the complete plant is a sphere. It requires refueling every 18 months, and refueling takes 24 hr, with an additional 24 being allowed for reactor cooling. Plant cost will be $500 per kw for the 10,000-kw plant and $350 per kw for a 50,000-kw plant. Cost per kwhr will be 12½ to 18 mills.

Major innovations in water technology of nuclear power plants are the results of nuclear radiation, I. H. Welinsky and Paul Cohen, Westinghouse, and James M. Seamon, National Aluminate Corp, told the conference. They said that the conditions found include:

1. Decomposition of materials in water because of reactor radiation severely limiting the use of additives for corrosion control.

2. Increased tendency of fuel elements to foul with system corrosion products because of radiation.

3. Recombination of dissolved hydrogen and oxygen by gamma radiation, providing built-in oxygen scavenger.

4. Radiation-induced reactions of dissolved gases, altering radically the pH of primary water, and other problems of radioactivity.

Radiation influences corrosion in nuclear power plants, said W. Z. Friend, International Nickel Co. Nitriding increases the corrosion of stainless steels. Concentration of chlorides contributes to corrosion. Oxygen is necessary to corrosion, and there appears to be a relationship of chloride to oxygen content.

Economic justification of supercritical units must be based on the cost of obtaining the additional efficiency they provide, said S. W. W. Mitchell and R. E. Gaunt, Westinghouse. When a 1,450-psi, 1,000F/1,000F unit is used as a base, they said, savings of 1,000 to 1,500 Btu per kwhr can be realized by going to supercritical units. The steady upward trend in cost is pushing efforts to find more efficient methods.

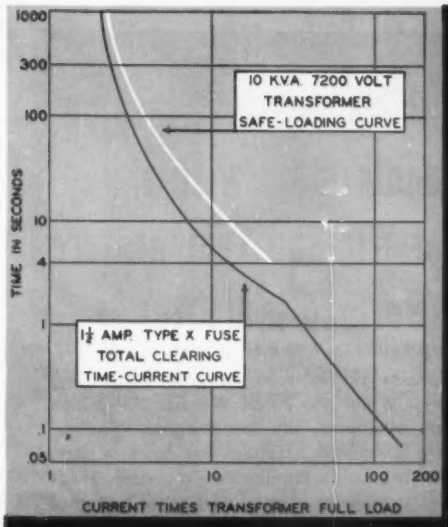
J. W. WEST, Foster Wheeler Corp; R. M. Curran, General Electric Co; and J. J. Fleischmann, Allis-Chalmers Manufacturing

Strength and weldability are essential properties of metals for supercritical temperature service, according to R. M. Curran, GE. Another quality of importance in steam turbine construction is long life. Although materials have been developed for high-temperature service in aircraft gas turbines, this use contemplates only 1,000 to 5,000 hr of service life. Steam turbine materials must perform from 100,000 to 300,000 hr.

The 3,500-psi, 1,050F/1,050F cycle is proving more economical than the 3,500-psi, 1,150F, 1,050 cycle, J. J. Fleischmann, Allis-Chalmers Mfg Co, said in reporting studies of three cycles for 300-Mw cross-compound units.

Combustion Engineering, Inc, has upheld the industry's high record for boiler availability by developing first the controlled circulation boiler and then two-furnace units

(*Continued on page* 51)



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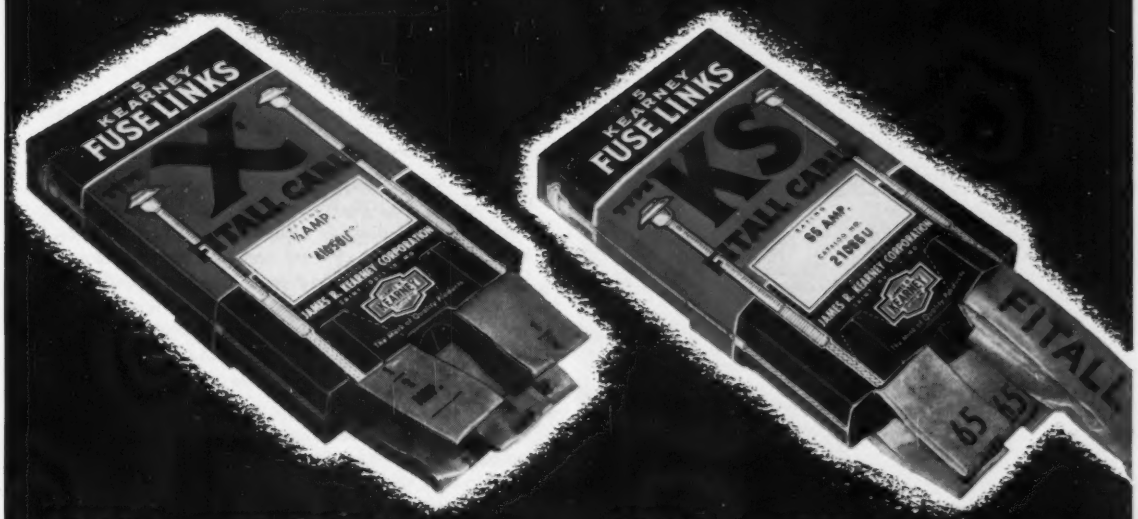
when you use KEARNEY *Specialized* FUSE LINKS

Coordination protects two ways: guarding equipment against overload damage *and* protecting you from needless load dropping and revenue loss. The matched time-current characteristics of KEARNEY specialized fuse links make possible safe, accurate coordination.



TYPE "X" . . . specially developed to keep transformers in service during overloads and surges, yet always interrupting before the damage range is reached . . . opens 230% of rated load within five minutes.

TYPE KS . . . specially developed to protect and yet minimize outages on circuits subject to switching and lightning surges . . . carries overloads up to 150% indefinitely without damage to fuse or cutout.

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The Mark of Quality

Prevent service interruptions... Install Wagner Distribution Transformers with the Wagner Winding-Temperature Overload Indicator

No more guesswork. No more costly, time-consuming load surveys. When you install Wagner distribution transformers equipped with the Wagner Winding-Temperature Overload Indicator you have a safe, accurate loading guide for distribution systems feeding rapidly growing residential and small industrial loads.

If an indicator-equipped transformer is overloaded, a brilliant red signal—which can be easily spotted—flashes on immediately. The operation of the transformer is in no way affected.

With this advance warning of overloads approaching the danger point, you have plenty of time to replace the overloaded transformer with a larger unit before a customer-annoying outage occurs.

REMEMBER, **the Wagner Indicator is actuated by winding temperature**

This is important because transformer winding copper is subject to the highest temperature. There is no time delay as with indicators actuated by oil temperature. When the thermal element embedded in the transformer winding is heated to a predetermined temperature by an overload—on goes the signal lamp. Lamp stays lit until turned off by lineman who moves operating handle to "RESET" and then back to "NORMAL" position... handle is designed for hot-stick operation.

Write today for more information about Wagner indicators or, better yet, have a Wagner engineer explain how Wagner indicators can save you money by safeguarding your investment and preventing service interruptions... there's no obligation of course.

Wagner Winding-Temperature Overload Indicators can be furnished on Wagner oil-filled distribution transformers 3 to 100 kva single-phase and 9 to 150 kva three-phase, 15 kv and below.

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AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

T55-17

H. L. SOLBERG, head, School of Mechanical Engineering, Purdue University; E. M. Powell, Combustion Engineering, Inc; R. J. Zoschak and E. L. Daman, both of Foster Wheeler Corp

(*Continued from page* 48)

for higher pressures and temperatures, reported E. M. Powell of that company. He predicted that units of 500-Mw capacity will be in service by 1960 and will be designed for at least 2,300 psi and 1,060F, many above 1,100F. Separate furnace units, he observed, are ideally suited for these conditions because of their implicity, flexibility, and performance.

Cost differences and procurement difficulties in obtaining some varieties of seamless pipe for central station use have prompted a search for other pipes that may be reasonably acceptable, Frank A. Ritching, Ebasco Services, Inc, told the conference. One possibility is electric fusion welded pipe which may be considered for these uses.

1. Reheat or similar weight piping.

2. High-pressure boiler-feed piping beyond the scope of seamless pipe, except forged and bored.

3. High-pressure, high-temperature main-steam lines where pipe run is straight.

By exchanging electricity and steam for high viscosity fuel and raw water the new Linden generating station is expected to achieve a substantial improvement in economy without an increase in steam conditions, according to F. P. Fairchild, Chief Engineer, Public Service Electric & Gas Co. By building the generating station next to the Bayway Refinery of the Esso Standard Oil Co. the exchange was made possible to the mutual advantage of the two industrial processes (See page 16).

Discussing the economics of relacing generating capacity, L. B. LeVesconte, Sargent & Lundy, said that there is a time in the life of a generating unit when it is most economical to the whole system to retire it. This time is not a function of the bookkeeping methods for depreciating the unit or the book value of the plant at any particular time, but of the scheme that has the minimum present worth of annual costs for all future years.

Lower investment cost indicates economies can be effected by installing gas turbines for peak-load generation on large utility systems, W. D. March and C. M. Wright, GE, reported. They presented cases where 7.5 and 15% reserve capacities were required. Added fuel costs for the gas turbine, they said, may be offset by savings in carrying charges.

Improvement in heat rates from 5 to 9% can be obtained by combining the steam and gas turbines in a single cycle, R. J. Zoschak, Foster-Wheeler Corp, said. Cycle simplification can be obtained through use of the once-through boiler principle. Development of coal firing for the gas turbine broadens the market for the combined cycle.

An efficiency increase of 6.9 to 8.5% with the combined steam-gas turbine cycle was reported by J. W. Mann, GE. Investment costs are no greater than those of present plants, he said, pointing out that the smaller boiler saves building space and outlay.

Turbine drives for boiler feed pumps cost more than motor drives unless a full-capacity turbine drive is used, A. G. Mellor, GE, declared. The added cost is justified by increased station output although there is no justification for more than two turbine-driven pumps per unit.

J. A. Tillinghast, American Gas & Electric Service Corp, described the substitution of full-capacity steam-turbine-driven boiler feed pumps for three half-capacity, motor-driven pumps. This step reduced plant investment per kw, improved cycle performance, and increased plant capability approximately 2% (EW, Nov. 28, 1955, p66).

Fly ash and slag from pulverized-fuel boilers have a proved market value, reported R. B. Freston, Commonwealth Edison. Sales in 1955 reached 161,000 tons and saved $102,843 in disposal cost. Both waste products have been used mostly in concrete where they improve its characteristics. A mixture of the two with lime shows promise as a pavement base.

Achievement of the efficiency and capability inherent in modern steam station design demands excellent control of water conditions to prevent corrosion and deposition. A survey of 21 modern boiler-turbine units by H. A. Grabowski, H. D. Ongman, and W. B. Willsey, all Combustion Engineering, revealed marked improvements in the oxygen and dissolved-solids content of feedwater. But it pointed up copper as a problem and also questioned innovations in the thermal cycle for marginal gains in efficiency.

They concluded that chemical control alone does not assure freedom from corrosion in the pre-boiler cycle but that coordination with design is effective. Other observations were:

1. Corrosion of iron and copper is minimized where pH rise is entirely from chemical additives.

2. Control by volatile alkaline additives fails if CO_2 or SO_2 are plentiful.

3. Oxygen increases corrosion and defeats attempts to measure quality of water.

ELECTRIC POWER STATIONS SESSION Chairman W. A. Lewis, Illinois Tech, confers with L. B. LeVesconte, Sargent & Lundy; and A. E. Beardmore, General Electric Co

4. Ammonia in the 8.5-9.5 pH range cuts corrosion of copper.

Corrosion of metal structures in the soil around and under power plants may be more serious than in the boilers, contended R. M. Wainwright, Good-All Electric Mfg Co, and D. P. Price, Montana-Dakota Utilities Co. Cathodic protection often controls such corrosion but requires heavier current when the metal is bare. New plants, they said, should provide tar or asphalt covering on metal in the ground, backed up by cathodic protection.

Development of economic dispatch computers has enabled operation of generating stations for lowest cost of delivered power, said H. W. Colburn, West Penn Power Co; R. B. Squires and R. T. Byerly, both Westinghouse. Such computers overcome the complexity of applying transmission losses to station production costs which formerly guided generation programs.

Automatic dispatch equipment at Kansas City P&L Co now controls all generators for frequency, interchange with neighboring systems, and minimum cost of delivered power, said R. E. Franck, GE.

Card Program Calculator Aids Utility

A card program calculator is used by Hydro-Electric Power Commission of Ontario to analyze many power system problems, reported P. L. Dandeno. Among these are problems formerly solved by analogue computers or approximations or not previously tackled. Specific applications include:

1. Determination of system loss charges against interconnections.
2. Coordinating generation between hydro and steam for fuel economy.
3. Simplifying calculations of transient stability.
4. Determining limits for steady-state stability.
5. Analyzing power flow in a complex mesh.

As loads grow right-of-way requirements for lines at present voltages become excessive, said H. W. Collins, Detroit Edison Co. Although underground lines would solve this problem, costs for 138-kv cable would be 17 times those of 345-kv double-circuit overhead lines of equivalent capacity. Overall cost of a few EHV overhead lines with a moderate amount of costly station apparatus is less than a lower voltage system of equal capability composed mostly of underground circuits and less costly station equipment.

Residential Voltage Brings Disagreement

Early decision about future residential distribution was urged by R. F. Lawrence, Westinghouse. Facets of this decision should cover requirements of house heating and heavy appliances, choice between single phase and 3 phase, economic combinations of transformer and secondary wire, and the service voltage.

Lawrence demonstrated savings in distribution investment by use of 265/460-v 3-phase for heavy residential loads but conceded that 240/480-v single-phase was almost as economical. In summary, he predicted that the higher voltage would pose no serious problems to appliance manufacturers or consumers. And savings to the utility could reach 26%.

Pitfalls confronting Lawrence's proposal were presented by D. K. Blake, GE. Chief among them was that such a change requires careful consideration of the consumer. Blake's calculations indicate the average consumer might save $1.20 per month after 30 years when consumption reaches 13,000 kwhr annual average.

Utility comments ranged from enthusiastic endorsement of the higher-voltage proposal to cool denunication. L. G. Smith, Baltimore Gas & Electric Co, noted the acceptance of higher service voltage for commercial buildings and opined that any plan to stand on lower voltage for residential service would prove untenable. Smith singled out motor starting as one area in which the higher voltage would pay premiums.

G. R. Coffman, Texas P&L Co, found little reason to doubt savings with 240/480-v service. He noted that areas of 10 to 20 kva per customer have scattered houses well over this demand which require costly reconstruction of 120/240-v distribution. More support came from W. R. Bullard, Ebasco Services, Inc, who noted favorable conditions for higher voltage in the South and Southwest and urged prompt experimental installations.

Combination Companies Promote Gas

Combination utilities have no immediate reason for higher service voltage, suggested H. K. Sels, Public Service Electric & Gas Co. Promoting gas for fixed heating devices leaves low average residential consumption of electricity. Consequently they cannot reach a point where high voltage can save investment within 15 years. Calculations indicate, Sels added, that 265/460-v service costs 18% more than 120/240 at 1.6 kva demand per house but drops to 6% less at 2.5 kva. Underground service costs are more favorable to 265/460, showing 3% savings at 1.6 kva and 11% at 2.5 kva. A major obstacle would be inducing customers to select the higher voltage.

Other reasons advanced for proceeding slowly were:

1. Utilities would have to invest more now to attain future savings—David Burns, Detroit Edison Co.
2. Trees would bar 34.5-kv feeders in residential areas. Present 120/240-v system is adequate for 9 to 12 kw per customer—H. C. Bingham, Cleveland Electric Illuminating Co.
3. Higher voltage has a distinct advantage for commercial buildings, but customers should install their own autotransformers—T. C. Duncan, Consolidated Edison Co.
4. Higher voltage for residential service may not be justified for 20 years—K. S. Garrett, Philadelphia Electric.

Distribution Investment Held to 45%

Constant policing has held distribution investment to 45% of total plant despite generating plant economies and has cut distribution operation and maintenance from $6 to $4.75 per $100 of plant investment, reported C. Myron Lytle, Kansas City P&L Co. Areas in which study might be rewarded, he suggested, are:

1. Distribution transformers built for summer load peaks, possibly using higher temperature insulation.
2. Meters to measure consumption with reasonable accuracy at lower cost, possibly equipped to print the bill which the meter reader would hand to the customer.
3. Construction changes to enable more economical use of aerial and underground cable.
4. Load limiters to block use of water heaters and clothes dryers during air conditioning and range peaks, thereby improving load factor.
5. Appraisal of reliability needs to avoid extra investment in system designs that provide service too good for the price.

BPA Offering Contracts of Long-term Interruptible

Bonneville Power Administration is offering long-term contracts for 680,000 kw of high priority interruptible power to its electro-process industrial customers and earmarking another 100,000 kw of interruptible for new industries. All of it is subject to preference marketing provisions.

BPA said sale of the 780,000 kw at the regular 2-mill per kwhr interruptible rate will provide an average of $9-million income a year for the government. The bloc of power is available 65% to 100% of the year, depending on stream flow. In water-short years, it is subject to immediate curtailment.

BPA Administrator William A. Pearl said the long-term contracts would formalize present arrangements with aluminum and other metal-reduction processors. The special 100,000-kw bloc would provide power for new industries pending operation of non-federal hydro projects, such as Priest Rapids or Rocky Beach, from which the new firms plan to obtain their power in the future. It will then supplement these sources.

BPA also plans to make available large blocs of previously unmarketable low-grade secondary power, available from 30% to 65% of the time in good water years. This would make feasible the construction of a number of non-federal steam plants, ideas for which have been circulating recently.

Changes in Capacity Reported to FPC

PLANT ADDITIONS DURING JANUARY

State	Utility	Plant	Fuel	Capacity
Ohio	Stryker Board of Public Affairs	Stryker	IC	660
Ill.	University of Illinois	Abbott	S	3,000
Ill.	Central Illinois Electric & Gas Co	Saybrook	S	30,000
Minn.	Roseau Municipal Water & Light Plant	Roseau	IC	1,360
Mo.	Pleasant Hill Municipal Utilities	Pleasant Hill	IC	1,000
N. D.	U. S. Army Engineers	Garrison	H	80,000
S. D.	Ft. Randall Project	Ft. Randall	H	40,000
Kan.	Norton Dept of Utilities	Norton	IC	1,000
Ga.	Tennessee Valley Authority	Nottely	H	15,000
Ark.	Conway Light, Power & Water Dept	Conway	IC	2,470
N. M.	Town of Farmington	Farmington	IC	750
Nev.	Truckee Carson Irrigation District	New	H	800
Wash.	Public Utility District No. 1 Pend-Oreille	Box Canyon	H	66,668

RETIREMENTS

Conn.	Hartford Electric Light Co	Tarriffville	H	1,500
N. Y.	New York State Electric & Gas Corp	Owego Tower	H	560
N. Y.	Niagara Mohawk Power Corp	C. R. Huntley	S	35,000
N. J.	New Jersey Power & Light Co	Columbia	H	270
Ohio	Stryker Board of Public Affairs	Stryker	IC	89
Ind.	Indiana & Michigan Electric Co	Marion	S	10,000
Wis.	Northern States Power Co	Sparta	H	90
Minn.	Jackson Electric Light Dept	Jackson	S	187
Iowa	Vinton Power & Light Co	Vinton	IC	240
Mo.	Missouri Public Service Co	Pleasant Hill	S	1,000
Mo.	Missouri Public Service Co	Trenton	IC	500
Mo.	Empire District Electric Co	Bolivar	IC	700
Mo.	Empire District Electric Co	Greenfield	IC	1,576
Mo.	Tri-County Electric Cooperative Association	Lancaster	IC	304
Neb.	Hastings Utilities Dept	North Denver	S	2,000
Kan.	Neodesha Municipal Light & Power Dept	Neodesha	IC	375
Va.	Appalachian Electric Power Co	Damascus	H	168
S. C.	South Carolina Electric & Gas Co	Charleston	S	19,000
La.	Lafayette Utilities System	Lafayette	IC	820
Tex.	Southwestern Public Service Co	Jowett	S	6,500
N. M.	Public Service Co of New Mexico	Domino	S	3,450
N. M.	Public Service Co of New Mexico	Las Vegas	S	4,260
Ariz.	Tucson Gas, Electric Light & Power Co	Tucson	IC	1,400

U. S.	Hydro	Steam	IC	Total
Added	202,468	33,000	7,240	242,708
Retired	2,588	81,397	6,004	89,989
Adjustments Plus	20	22,975	1,337	24,332
Adjustments Minus	0	0	0	0
Net Change	+199,900	−25,422	2,573	177,051

H—Hydro, IC—Internal Combustion, S—Steam
United States Capacity as of February 1—Hydro, 25,137,759 kw; Steam, 87,056,898 kw; IC, 2,353,790 kw; Total, 114,548,447 kw.

POWER BRIEFS

● Idaho Power Co has announced that with completion of its substation at Quartz, Ore., the company's expenditures on Northwest Power Pool facilities will total $2.5 million. The utility recently completed a 47-mi, 230-kv transmission line linking its Snake River dams with the power pool.

● An $84-million nuclear power station in southern Scotland is under construction, Britain's Atomic Energy Authority reports. The 200,000-kw station, located at Chapel Cross, will have graphite-moderated and gas-cooled reactor in operation before 1959, three additional units completed by 1960.

● Virginia Electric & Power Co's board of directors has authorized construction expenditures of $50 million for 1956. About $11 million will go for construction of 150,000-kw Yorktown Power Station located near American Oil Co refinery.

● New construction in the next four years will cost Puget Sound Power & Light Co, Seattle, Wash., $87 million. The program includes 160,000 kw of added generation on Baker and Snoqualmie Rivers accounting for $38 million.

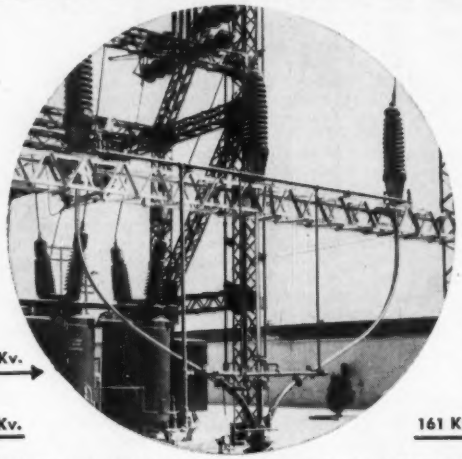
● Three 135-in. Francis turbines are being built for the Pelton Hydro Electric Development site of Portland General Electric Co on the Deschutes River, 120 miles southeast of Portland, Ore. Each turbine will develop 55,000 hp at 138.5 rpm under a 150-ft head and drive a 36,000-kva, 13.8-kv generator with a power factor of 0.9. Shipment of the first turbine will be started in 16 months and the initial generator two months later.

● September 1 is target date for turn-over of Southern California Edison Co's Alamitos Plant's 160,000-kw unit. The $24-million addition will be followed by a No. 2 unit with 160,000-kw capacity. Units 3 and 4 will have a capacity of 200,000 kw each.

High Pressure . . . Oil Filled
POTHEADS by G&W

Proper treatment of mechanical and electrical stresses permit this simple G&W design. Full 200 pound pipe line oil pressure is retained by the relatively small bore porcelain shell. Tested at 500 p.s.i. pressure. **No castings are used to seal oil under pressure.** Top and bottom fittings are fabricated non-magnetic stainless steel—sealed by fully retained "Resistoyl" gaskets.

Stress relief cone, supplemented by porcelain stress control tube, makes efficient use of the internal diameter and length of porcelain shell—and reduces the amount of installation labor.



G&W Type "ATA" (high pressure) and Type "ATL" (low pressure) oil filled potheads in each voltage class meet the FULL level of electrical characteristics established by American Institute of Electrical Engineers Standards No. 48—WITHSTAND TEST VOLTAGES.

RATED VOLTAGE Kv.	60 cycle Tests RMS Kv.			Impulse Tests
	1 minute Dry	10 seconds Wet	6 hours Dry	1.5x40 ms, Crest Kv. Full Wave
69	175	145	118	350
92	225	190	139	450
115	280	230	163	550
138	335	275	191	650
161	385	315	221	750
230	545	445	315	1050

G&W has supplied potheads (including 230 Kv.) for many of the important oil filled cable installations in U. S. A. and foreign countries. G&W cooperates fully in furnishing complete installation instructions.

G&W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois
Representatives in principal cities of U. S. A.
Canadian Mfrs.—Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

G&W

A563

Freezer Sales: What's Wrong?

Detroit Edison survey finds its customers need schooling in home freezers' advantages. 70% of non-owners don't want one

If food freezers are to gain greater public acceptance, a long-term task of educating the consumer lies ahead.

This, at least, is the conclusion drawn from a home freezer market survey just completed by Detroit Edison Co.

The utility found a distinct lack of interest in home freezers among customers in its service area. More than 69% of the respondents who didn't own freezers said they had no interest in buying one. A whopping 92% of this group furthermore said that even if given the opportunity, they wouldn't accept a freezer in their home on any sort of a free trial plan.

Interviewed 421 Customers

To carry out the survey, Detroit Edison personally interviewed 421 of its customers. Of these, 260 were non-owners of freezers, and 160 were persons who had been using a freezer for six months or more. Other findings:

- More than 66% of the non-owners gave "just don't have any use for one" as principal reason for not wanting to own a freezer. This suggests that people generally have little knowledge of the freezer's uses and advantages. A smaller group (52%) said they couldn't afford one, 19% said they had no place to put it, and 11% said they were too expensive. Only one person mentioned cost of operation as a reason for not wanting a freezer.
- Of the 80 persons out of the 260 non-owners who said they would like to have a freezer, more than 91% of them gave convenience as the major reason. Other reasons given: Save money (53%), like to freeze own produce (36%), more food variety (39%).
- Still 70% of those who wanted a freezer hadn't bought one yet because they felt they couldn't afford it—this in spite of the fact that 80% of them are in the middle and upper income brackets. From this, says Detroit Edison, it is easy to see that freezers are losing out in the competitive scramble.
- Among freezer owners, however, there was universal acceptance of its value. All freezer owners interviewed expressed complete satisfaction, 97% naming convenience as the biggest reason, 50% naming economy. Almost 80% of them said they would rather own a freezer than a two-zone refrigerator.

The survey found some correlation between exposure to advertising and desire to own a freezer. Of those who wanted to own a freezer, 90% said they had seen freezer ads. Among those who did not want a freezer, this figure dropped to 76%. In both cases television was mentioned most.

Detroit Edison also discovered some interesting things about the character of freezer owners. A bit more than 95% of them lived in their own homes—a slightly higher figure than for the group that did not own freezers. Incomewise, however, this group was distributed about the same as the non-owners. Another survey in 1949 revealed that freezer ownership was restricted almost exclusively to the upper middle and upper income groups making freezers a luxury item. Not so today. Among freezer owners in the present survey 69% were in the middle income group, 21% in the upper and 10% in the lower.

Who Bought, and Where

The old theory that large families are the ones who purchase freezers likewise has undergone change. The study showed the difference between average number of persons per freezer-owners versus non-owners was negligible (only 0.2 in favor of owners).

As to where they purchased their freezers, 60% of owners bought them from appliance dealers. Ownership of chest and upright type freezers was pretty evenly distributed (46% for upright as against 54% for chest).

Seventy-two per cent of persons interviewed purchased food for their freezers at supermarkets. Only 3% used a food freezer plan.

Another surprising fact turned up by the survey: Almost 60% of freezer owners had a refrigerator with a freezer compartment. But when these people were asked which they would choose, assuming that they only could own a freezer or a two-zone refrigerator, 66% chose the freezer.

In summarizing the results, Detroit Edison had some words of advice for freezer manufacturers: "Any promotion undertaken," it said, "must be based on informing and educating—two things which freezer makers are not now doing. Their only interest is in emphasizing the structural features of the unit. Also, as education is characteristically a slow process, the promotion, to be successful, would have to be carried out on a continuing long-term basis. A one-shot, short-term effort would produce very limited results."

S&S SHORTS

Commercial Cookery Climbs

A "trial-use" demonstration policy helped Pennsylvania Power & Light Co add over $250,000 of new commercial cooking business to its lines last year. Additional load of 16,761.9 kw connected during first 11 months was 11% higher than same period year before.

Kitchen Work Pays Off

Approximately $20 million was spent for remodeling kitchens in 1955, according to a Hotpoint Co survey. Canvass revealed that top remodelers worked on 45 to 65 jobs last year with average gross of $1,700 per job. For 93% of appliance dealers not cashing in on this business, the company suggests hiring of a kitchen specialist, stock of three basic built-ins—range or surface unit, dishwasher, and refrigerator.

Two Corning Booklets

Two free booklets offered by Corning Glass works for lamp designers, engineers and architects are "Corning Brand Glassware for Residential Lighting" (catalog no. L-130), and "Corning Low Brightness Curved Lens Panel" (catalog no. L-110-B). Write Lighting Sales Dept, Corning Glass Works, Corning, N. Y.

Copperweld Withstands Record Glaze

Extremely heavy loading of ice on overhead power and telephone lines was a result of a recent storm near Anchorage, Alaska. The glaze accumulation put a terrific strain on the conductors of the Alaska Communications System. This line, vital to our national defense, was built in 1943.

Thickness of the glaze on the wires varied from a 2-in. diameter to the 14-in. coating shown. However, no breaks occurred in the wires. Copperweld wire used here is 0.128 in. in diameter and the poles are spaced 155 ft apart. Each wire of the span length supported about 4.5 tons of ice.

This thickness of ice is believed to be an all-time record anywhere, according to William W. Ege, vice president in charge of the Wire and Cable Division of Copperweld Steel Co.

A-C Develops New Motor for General Industrial Use

A new motor that is "looking for jobs to do" in industry was introduced recently by Allis-Chalmers Mfg Co. The Synduction motor was developed to combine the constant speed characteristics of the synchronous motor with the rugged mechanical construction of the induction motor.

Applications of the motor were explained by E. F. Greiwe, manager of product sales for A-C's Norwood Works where the unit was developed. Greiwe declared that the motor "will find applications wherever synchronous reluctance motors are now used and . . . would be used, but are not now because of poor performance."

The motor is available in ratings from ¼ to 40 hp. It is built on standard induction motor frames and uses a simple die-cast rotor.

A-C engineers explained that the Synduction motor does not require brushes, slip rings or rotor windings, separate source of d-c excitation, or the special starting equipment needed by standard synchronous motors.

Manufacturers Report Huge Order Backlog

Three manufacturers of steam generators, condensers, nuclear and associated equipment report backlog of orders for the end of 1955 as follows:

Company	Amount
Babcock & Wilcox	$213,456,000
Combustion Engineering	216,065,000
Foster Wheeler	166,618,000

238 American Standards Approved by ASA in 1955

American Standards Association approved a total of 238 American Standards during 1955, stated George F. Hussey, Jr., managing director of the Association. This contrasted with 153 American Standards approved in 1954. In the Electrical—Power and Lighting class, 19 American Standards were approved in 1955. Revised and reprinted standards are not included.

There are now 388 projects for standards being carried on under ASA auspices, Hussey reported. He announced progress in the planning of standards for nuclear energy processes, which was begun by industry through the ASA in December 1955. Hussey advised American Standards are available in 46 other countries.

In international standards work Hussey said that France still leads the world and the U. S. is 13th in line.

Union Electric Plans End of Hevi-Duty Ownership

Union Electric Co of Missouri has filed with Securities and Exchange Commission for permission to divest itself of its subsidiary, Hevi-Duty Electric Co, Milwaukee, Wis.

Under the proposed plan, Union Electric would distribute on June 29 one share of Hevi-Duty $5 par common stock for each 30 shares of Union Electric common held. The utility estimates that about 345,000 Hevi-Duty shares would be involved.

$100 Truck-Cover-Office

Masonite Corp released recently a building plan for a demountable pick-up truck cover which can be converted into a field office and left at a construction site. The structure can be built, according to Masonite's calculations, at a materials cost of about $100. For a free copy of the plan, No. AE-321, write to Builders Service Bureau, 111 W. Washington St, Chicago 2, Ill.

(*More M&M on page* 59)

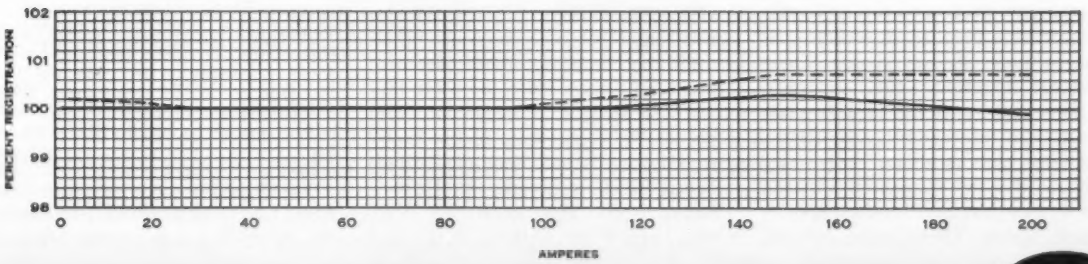
...match your 200 ampere service entrance equipment with Sangamo J2 200 ampere meters

With bigger and bigger loads to handle every day, it makes good sense to match full service entrance capacity with watthour meter capacity.

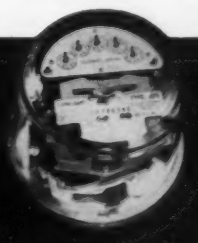
Sangamo J2 50-ampere nameplate rated watthour meters have straight-line accuracy up to 200 amperes.

Torque characteristics of the 50-ampere J2 are high . . . 74.0 mmg. at nameplate rating. Average starting watts are low—only 18 watts. Just twice the starting watts of the J2 15-ampere meter.

The straight line accuracy of the J2 50-ampere single-phase will meter your "full use" customers' loads even if their demand goes to 48 KW. Take a look at the chart at the bottom of this page.



JM56-2



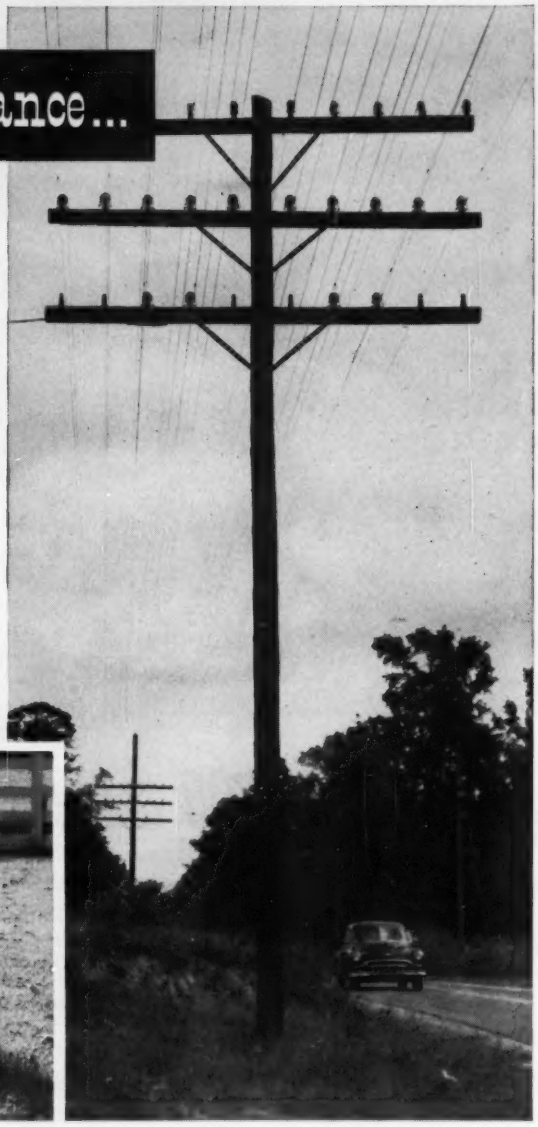
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

Here's Proof of Performance...

Pressure-creosoted poles stand up better

reports North Carolina Utility



The Carolina Telephone & Telegraph Company, serving 100,000 customers, is the largest telephone utility in North Carolina, and has been using pressure-creosoted pine poles since 1925. At the present time they have more than 154,000 poles in use on more than 4,500 miles of line. They are adding to this number at the rate of about 10,000 poles per year and within a short time the few remaining untreated poles will be replaced with pressure-creosoted poles. All of the pressure-creosoted poles in use here were supplied by a treater who uses USS CREOSOTE.

The operating officials of the Carolina Telephone & Telegraph Company say that pressure-creosoted poles enable them to offer their customers more efficient service. Their pressure-creosoted poles not only withstand the attack of termites, rot, fungi, and adverse soil conditions, but they also stand up well under adverse weather conditions like the hurricanes that have hit their area in recent years. These same officials add that they are convinced that pressure-creosoted poles are a worthwhile protection for their valuable investment in service and equipment.

For more information on pressure-creosoted utility poles, send for the free USS booklet, "A Report on Pole No. 92159." Just write to the nearest District Sales Office of United States Steel or directly to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

The poles in this line of the Carolina Telephone & Telegraph Company, located near Pinetops, N. C., have been in service for 25 years, and the company believes they are good for several more years. Although the overhead line load has doubled in the last decade, these older pressure-creosoted poles are still strong enough to handle the increased load.

You can obtain clean pressure-creosoted poles upon specification without sacrificing pole service life.

USS CREOSOTE

6-624

SALES OFFICES IN PITTSBURGH, NEW YORK, CHICAGO, CLEVELAND, SALT LAKE CITY AND FAIRFIELD, ALA.

USS

UNITED STATES STEEL

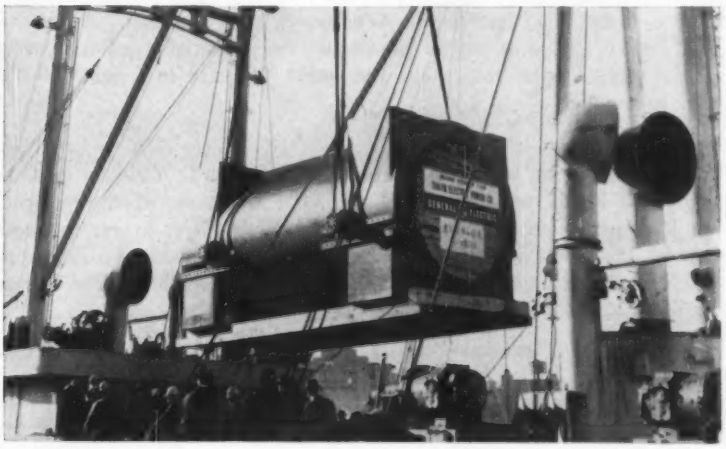
Consumers Power Displays Fiber Glass Pole to Industry

D. E. Karn, (left) president of Consumers Power Co, and H. S. Bennion, managing director of Edison Electric Institute, inspect a fiber glass pole and crossarm at a recent press conference in Alma, Mich.

The group was shown the first installation of fiber glass poles and crossarms in the industry. The new poles have been in service a little more than a year on a rural line of Consumers Power (EW, Mar. 5, p 164). The demonstration was sponsored by Line Material Co, distributors, and Consumers Power Co. Gar Wood Industries, manufacturer of the poles, participated. Detroit Edison Co was also represented.

The group witnessed a demonstration of the simplicity of handling and installing a fiber glass pole. The pole is drilled so that the arm passes through the pole. The arm can also be installed with metal gains without drilling the pole.

The 35-ft Class 6 equivalent pole is 11 in. in diameter. Present cost is $150. Life span is estimated at 50 to 100 years. Strength is quite uniform—within plus or minus 5%.



Another Export—

GE Ships Giant Stator to Japan

Port of New York's heaviest peacetime shipment of a single item was made late in March when this steam turbine-generator stator weighing 185 tons was loaded aboard the motor ship KYOEI MARU for Japan. It was the first major piece of a 125,000-kw steam turbine-generator to be shipped by General Electric Co to the Tokyo Electric Power Co's Chiba thermal power station.

Meanwhile Tokyo Electric is negotiating with International General Electric Co for a tandem-compound, triple-flow, 50-cycle, 175,000-kw turbine-generator for the same station.

M&M BRIEFS

Minnesota Mining & Manufacturing Co has announced price reductions from 5 to 15% on two Scotch brand PTF electrical insulation films. The price cuts apply to Type LS, described as a pressure-sensitive tape with a polytetrafluoroethylene backing, and Type B, a PTF film in an unfused form.

Atomic Energy Commission announced that more than 80 representatives of 28 industrial firms visited facilities at Oak Ridge, Tenn., during the first two months in 1956. The visits were made under the AEC access permit program. This is a part of the Commission's efforts for encouraging private enterprise participation in development of the civilian uses of atomic energy.

Griscom-Russell Co of Massillon, Ohio, will furnish four evaporators to supply distilled water to boilers for Consolidated Edison's No. 3 unit at the Astoria Station and No. 2 unit at the Arthur Kill Station. Each boiler, being rated 2.5 million lb per hr steam for 2,000 psi throttle, will be connected to two evaporators.

BUSINESS OUTLOOK

Electrical World
APRIL 9, 1956

There's important new evidence that business' ambitious 1956 plans for capital spending will actually be carried out. The evidence comes from the McGraw-Hill new orders index. February's new orders for machinery, other than electrical, were up 19% from January, and 49% from the level of February 1955. (And 1955, as you'll remember, was no bad year!) Some categories of equipment run especially high. Engines and turbines, for example, were up 82%, and metalworking machinery, 65% from year earlier levels. The increase in industrial building contracts—128%—is even more eye-popping.

• • •

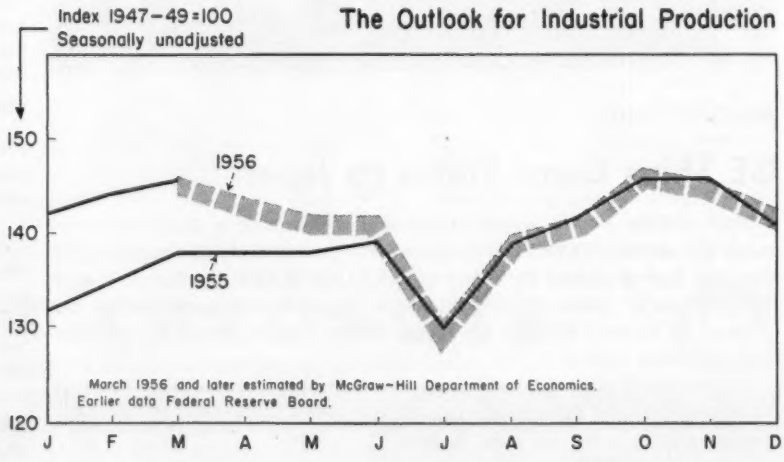
These figures are significant because they usually reflect the level of operation of the industries concerned, three to six months in advance. Of course, where industries are already producing to capacity, the new orders may merely go to swell the backlogs. Even so, they help insure against any downturn. And they provide incentive for breaking production bottlenecks by more liberal use of overtime, extra shifts, marginal labor, upgrading, mechanization and automation.

• • •

So industry as buyer should be generating plenty of demand. **The question is whether the prices industry will have to pay won't be rising even faster.** There's been a welcome softening, in the last week, of premium prices on copper. There's doubt though, that this will hold, in the face of growing demand and the probability of strikes or heavy wage pressure from the leftist Mine, Mill and Smelter Workers. **And other elements in the cost picture seem clearly to be rising.** Steel scrap prices rose 4½% in a week and are now nearly 10% higher than last month, 42% higher than last year. Aluminum has just gone up 1½¢ a pound. Industrial raw materials, generally, cost nearly 9% more than a year ago. The recent 6% rise in freight rates is beginning to be felt.

• • •

The cost of money, too, still seems to be trending upward. Yield on medium grade corporate bonds rose from 3.58% to 3.60% last week, which represents a ½ to 1% increase in the price of long term funds. Over a year this cost has risen by 3%. Now several New York banks have announced a rise from 3½ to 4% in their charge to brokers for loans against securities. The impact may be limited, but it's one more straw in the wind.

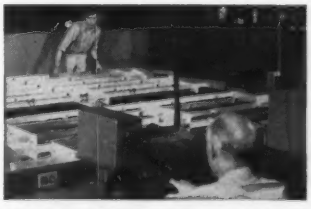


Choose from a wide range of standard Alcoa® Aluminum Bus Conductors for light, corrosion-resistant, economical bus systems

Whatever your installation or bus design problem is, there's an Alcoa Aluminum Bus Conductor so right for the job it's almost custom fabricated. Alcoa has developed shapes, alloys and tempers to meet the mechanical and electrical requirements for any bus conductor application.

Let us help you design your job in aluminum to get the most out of the many available types of Alcoa Aluminum Bus Conductors. Ask your nearest Alcoa sales office for assistance or address Aluminum Company of America, 2306-D Alcoa Building, Mellon Square, Pittsburgh 19, Pennsylvania.

Tensile properties of Alcoa Aluminum Bus Bars are checked on this Baldwin-Southwark tension-testing machine, periodically calibrated to assure precision.



A precision potentiometer records the voltage drop on test sections of Alcoa Aluminum Bus Bar in the Massena, New York, laboratories, world's largest facility for aluminum conductor research.

Your Guide to Aluminum Value

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ALCOA® ALUMINUM
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ALWAYS USE ALCOA ALUMINUM ACCESSORIES WITH ALUMINUM CONDUCTORS

What Are Your Residential Load Builders?

Conversation at EEI Sales Conference turns up some surprises. Room air conditioners are coming along in upper New York State, dryers selling in Texas

Utility customers appear to have a healthy disregard for geography when it comes to buying electrical appliances. Air conditioners, for instance, show up as promising load builders all the way from Arizona to upper New York State. Clothes dryers are a favorite load builder in the upper Midwest, parts of New England, as well as in the Southwest. Electric water heaters are finding their way into some territories also served by natural gas.

These are some of the impressions picked up in conversation at the Annual Sales Conference of the Edison Electric Institute held at Chicago, March 26-29. Our reporter queried a number of executives attending the conference and came up with this information:

Clothes dryers are right near the top as promising load builders for electric utilities. Sales executives look on it as an off-peak load in most areas. In Minnesota and Wisconsin some utility men think it has highest usage around noontime in winter. Explanation is that housewives use the dryers to dry coats and even shoes when children come in for lunch. In Texas and Arizona where climate is favorable for outdoor drying, dealers push the appliance as a convenience and labor saver. It keeps clothes out of the dust storms.

Room air conditioners of the refrigeration type are replacing the old "swamp coolers" in Southwestern states. The "swamp cooler" uses an evaporation process. Outside air is pulled through a water-saturated batting of straw or excelsior by means of a fan. Customers switch to the refrigeration coolers for drier air and to get rid of the water which dripped from the older coolers.

Air conditioners for residential and commercial use are now having an impact on loads as far north as upper New York State, and prospect is for increasing sales.

Electric water heaters, controlled for off-peak heating, are making gains in Wisconsin and other Midwestern states which have relied heavily on natural gas. They continue to offer promise in the Southeast. Acceptance of high-wattage, quick recovery heaters is gaining ground. Their sale is now permitted by around one-third of the electric utilities.

Dishwashers, electric blankets, television sets are going along nicely in many areas assisted by utility promotion.

In New England, the old reliables, ranges and refrigerators, are moving along at a respectable pace assisted by steady promotion.

In Kansas and a few other areas there is genuine enthusiasm for the lighting load. Sales executives see this as one of the most promising and profitable of all.

TECHNICAL NOTES

Railway electrification at power frequency is estimated to cost 5% less than at reduced frequency and 10 to 30% less than dc, largely because of investment savings. As diesel fuel costs rise, 60-cps electrification again offers favorable prospects for mainline service.

Irradiation at 100C drops the resistivity of cold-drawn copper as much as 1.8%. Conjecture is phenomenom resembles annealing and that tensile strength may be cut more drastically.

Printing press speed can be controlled accurately and smoothly by phase-shifting the grids of rectifiers provided to power the dc main driving motor from an ac source.

Red, green, or yellow paint is claimed to discourage pileated woodpecker attacks on utility poles. Their markmanship has reached a new high of 518 holes in 169 poles of an 879-pole line in wooded mountainous country.

Maximum permissible radiation exposure may cut human life expectancy three years, according to meagre available data. Predicting is based on 0.3 R per week for 3 years.

Migration of silver from contact surfaces across and into certain insulations which contact the silver can cut insulation resistance, sometimes to the point of failure. Prerequisites are high humidity and sustained dc potential.

AP&L Charges Bias in Rate Denial

- **Company asks for rehearing of denial of $5.2 million a year rate increase**
- **Accuses Arkansas PSC of 'predetermined intent to dismiss' rate application**
- **Says PSC rate base finding amounted to 'confiscation of over $11.5 million'**

Arkansas Power & Light Co, charging it did not get a fair and impartial hearing on its original application to the Arkansas Public Service Commission for a $5.2 million a year rate increase, has asked for a rehearing of the case.

The company has also filed a petition for an appeal to Pulaski Circuit Court. In the past the PSC has generally rejected the petition for a rehearing and granted the petition for an appeal to the courts.

In its petition to the PSC the company said:

"Throughout the entire proceeding there was an undercurrent of animosity on the part of the commission and the staff toward the merits of the company's case."

AP&L Charges 'Antagonism'

"The atmosphere was charged with antagonism which is evident from the rulings of the commission in the course of the hearing and the language of the order. It is apparent there was a predetermined intent to dismiss the company's application regardless of the content of the record."

The petition further stated that the PSC had found the company's present revenues sufficient "only be arbitrarily creating non-existent issues and by deciding every such issue in the case against the company." And it charged that in fixing a rate base of $196.7 million the PSC had in effect confiscated over $11.5 million of company property.

The rate application dismissed by the PSC would have given the company an increase of 12% over the then existing operating revenues.

In addition to making a reduction of 5% from the rate base claimed by the company, the PSC made arbitrary adjustments in expenses and revenues. These were a decrease of $1.3 million in sales and administrative and general expenses and an increase of $1.2 million in operating revenues from those customers which did not earn a hypothetical return of 6% on their allocated rate base.

With respect to the downward adjustment of sales promotion expenses, the PSC noted: "Sales promotion expense claimed by the company for the test period is $978,081. Staff exhibit . . . compares this expense with composite data for all privately owned electric companies operating in the U. S. as reported in Moody's Manual for Public Utilities. This national average is compared with the sales promotion expense of the company on the basis of its relationship to other expenses, and an adjustment of $293,547 is thereby derived."

Sales Promotion Expense High

The PSC went on to say that "The magnitude of this expense, totaling $978,081 before adjustment, is demonstrated by the fact that it almost equals total revenue of $984,635 received by the company for the production and delivery of 202,777,000 kwhr to 14 cooperatives at 83 different locations." The PSC does not expand its reasoning as to the validity of the relationship of these particular items to the various bases used.

With regard to administrative and general expenses claimed by the company, in the amount of $3.769 million, the PSC said: "This expense was compared with that of all privately owned electric companies operating in the U. S. . . . and an equated adjustment of $1,008,428 was computed."

Administrative Expenses Cited

The PSC noted that the company's rebuttal ". . . compares the administrative and general expense of the company with that of 12 other electric companies. These are the same companies with which the company compared its sales promotion expense. This selected group of companies, as previously stated, included two companies which are affiliated with the company. For the foregoing reasons, the commission is of the opinion and finds that administrative and general expense for the test period should be adjusted in the amount of $1,008,428.

"Both of the foregoing adjustments are reduced by 54.4% by reason of making income taxes commensurate with the adjusted expenses (Tr. 2152)," the order stated.

The foregoing comparison is, of course, very interesting since the PSC compared the expenses of Arkansas P&L having low cost of production with those of all utiliites whose production expenses are considerably greater because of the higher cost of fuel. From the opinion it would seem that the commission used a rather cursory statistical approach in excluding $1.3 million of sales and administrative and general expenses. The opinion does not disclose whether the PSC made any on the spot factual determinations of the validity of the disallowed expenses.

Adjustments Explained

As to the adjustments to operating revenues, these were increased by approximately $1.2 million, or an amount by which one large industrial customer and the Rural Electrification Administration's cooperatives failed to earn a return of 6% on their allocated rate base. Such allocations were made, as the PSC stated, on a "basis of use, which is universally recognized as a sound method of apportionment." This development appears to be something new and different in the field of public utility economics.

A further point of interest to the electric utility industry is that all customers should earn a 6% return irrespective of their economic characteristics of use and demand.

In the conduct of this rate case, the Arkansas PSC broke all speed records in arriving at their decision. The hearings closed on Feb. 29th, at which time the PSC received some 2,587 pages of testimony in evidence. On March 7th, or four working days later, the PSC delivered its opinion denying

the company's proposed increase in rates. While the speed of the decision in this particular case may have overcome the so-called regulatory lag, the reasoning processes pursued leave much to be desired from the point of view of investors as well as customers.

Tacoma City Light Gets School Board Complaint

The Tacoma, Wash., School Board is objecting to payment of the premium commercial rate to Tacoma City Light for electricity used by the city's schools.

All public bodies are charged the highest rate for utilities, as a result of a provision in an old city charter which states the City cannot give anyone a better rate for electricity than the general rate.

"The utilities do not pay any taxes to help support our schools and yet they give us no break on our electric bill," said School Director Mike Sterbick, proposing that schools should get the advantage of lower rates charged to home owners.

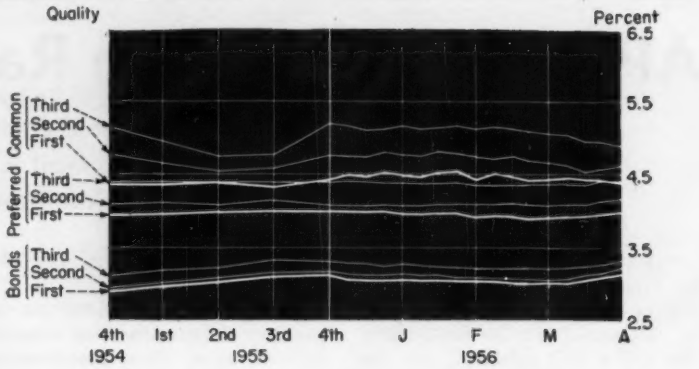
Business Manager Carl Caddey told the board City Light and other utilities make payments to the City in lieu of taxes but no other taxing body benefits from that money, all of which goes into the City's general fund. Other taxing bodies feel they should be entitled to a fair share of that money, Caddey said.

FINANCIAL BRIEFS

Higher Common Stock Dividends—Long Island Lighting Co will pay May 1 a quarterly common stock dividend of 27½¢ a share as compared with 25¢ a share previously . . . Central Hudson Gas & Electric Corp will also pay May 1 a quarterly common stock dividend of 20¢ a share as compared with 19¢ in the previous quarter.

Kona Light & Power Co stockholders have approved a plan to have it merged into the Hilo Electric Light Co. An original Hilo-Kona merger plan failed in 1955 to get the required approval of 75% of the stock shares. The new plan was okayed by 82% of the Kona stock and 91% of the Hilo stock.

Today's Utility Yields (%)



QUALITY	BONDS			PREFERRED STOCKS			COMMON STOCKS		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Mar. 29	3.13	3.19	3.30	3.98	4.17	4.41	4.40	4.61	4.91
Mar. 22	3.09	3.14	3.27	3.96	4.13	4.41	4.43	4.57	4.95

Utility Earnings

COMPANY	PERIOD MONTHS ENDED		NET INCOME 1955	NET INCOME 1954	1955	1956
Arizona Public Service	12	Dec.	$5,537,000	$4,589,000	$1.48(a)	$1.42(a)
Central & South West, consolidated	12	Dec.	19,764,842	18,166,433	2.04(b)	2.00(b)
Middle South Utilities, consolidated	12	Dec.	16,824,762	16,193,738	2.21	2.13

Notes—All the figures shown above have been audited; ((a) Based on average shares outstanding; (b) Based on 9,691,257 shares in 1955 and 9,091,257 shares in 1954.

Utility Financing

COMPANY AND DESCRIPTION	AMOUNT OF OFFERING (000)	OFFERING PRICE	YIELD TO PUBLIC
MARCH 29–APRIL 4			
Georgia Power—1st mtg 3⅝% due 1986	$12,000	100.375%	3.55%
Florida Power & Light—1st mtg 3⅝% due 1986	15,000	101.00	3.57
Columbus & Southern Ohio Electric—1st mtg 3¾% due 1986	12,000	102.738	3.60
Duquesne Light—1st mtg 3½% due 1986	20,000	101.871	3.40
COMMON STOCK			
Central Illinois Light—100,000 sh (being offered commonholders on 1-for-10 basis, record April 3 to expire April 19)	$5,150	$51.50	5.05%
SCHEDULE FOR APRIL			
BONDS			BID DATE
Kentucky Utilities—1st mtg due 1986	$10,000	.....	April 10
Southern California Edison—1st mtg due 1981	40,000	.....	April 17
Wisconsin Electric Power—1st mtg due 1986	30,000	.....	April 24
PREFERRED STOCK			
Kansas City Power & Light—120,000 sh $100 par	$12,000	.....	April 10(a)
Long Island Lighting—120,000 sh	12,000	.....	April 26(b)
COMMON STOCK			
New England Electric System—834,976 sh (to be offered commonholders on 1-for-12 basis)	.....	.....	.....
El Paso Electric—56,025 sh (to be offered commonholders on 1-for-15 basis, record April 4 to expire April 25)	.....	.....	.....

Notes—(a) Blyth & Co—First Boston Corp group, underwriters; (b) Blyth—First Boston and W. C. Langley & Co.

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STATISTICS

Power Company Capacity vs Total Generating Capacity

(Thousands of Kw)

	End of '55			Planned Additions		'55 + Planned Additions		
	Total†	Power Co.		Total†	Power Co.	Total†	Power Co.	
New England	4,590	4,520	98.5%	1,220	1,176	5,810	5,696	98.0%
Middle Atlantic	18,495	18,421	99.6%	6,027	5,078	24,522	23,499	95.8%
South Atlantic	12,274	10,829	88.2%	4,240	3,556	16,514	14,385	87.1%
East North Central	26,670	25,530	95.7%	7,847	7,354	34,517	32,884	95.3%
Subtotal	62,029	59,300	95.6%	19,334	17,164	81,363	76,464	94.0%
East South Central	12,246	3,787	30.9%	3,039	1,229	15,285	5,016	32.8%
West North Central	7,736	6,181	79.9%	3,837	1,838	11,573	8,019	69.3%
West South Central	8,407	6,573	78.2%	4,911	3,088	13,318	9,661	72.5%
Mountain	7,826	3,281	41.9%	2,623	1,895	10,449	5,176	49.5%
Pacific	14,073	8,603	61.1%	9,565	3,834	23,638	12,437	52.6%
Subtotal	50,288	28,425	56.5%	23,975	11,884	74,263	40,309	54.3%
Total U. S.	112,317	87,725	78.1%	43,309	29,048	155,626	116,773	75.0%

† Includes private utilities; federal agencies; cooperatives; and municipal, state, and power district systems.

Note: Figures include all power systems reporting additions to Electrical World's Construction Survey, Jan. 23, 1956 – pages 171-181.

Source: Compiled by H. J. Benzing, Philadelphia Electric Company

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Jan.	114.55	114.37	103.62	10.5
Peak—Class I Systems, million kw	Jan.	95.8	98.2	84.1	13.9
Estimated Dec. '56 Peak	Jan.	105.45	105.27	102.56	2.8
Production—billion kwhr	Jan.	51.12	50.72	43.96	16.3
Hydro		9.36	9.31	9.43	−0.7
Fuel		41.76	41.41	34.53	20.9
Sales—billion kwhr	Dec.	45.19	43.07	38.06	18.7
Residential		12.25	10.71	10.89	12.5
Commercial		6.81	6.61	6.19	10.0
Industrial		23.75	23.37	18.75	26.7
Other		2.39	2.38	2.23	7.2
Fuel Consumption	Jan.				
Coal—million tons		15.22	14.77	12.02	26.6
Oil—million barrels		8.22	8.54	8.91	−7.7
Gas—billion cu ft		68.27	70.00	65.13	4.8
Net Income Class A & B Co's—$ million	Dec.	125.72	104.29	107.10	17.4
Residential Customers—millions	12 mos.	44.41	44.30	43.14	2.9
Revenue per kwhr	ended	2.64¢	2.65¢	2.69¢	−1.9
Avg kwhr per customer	Dec. 31	2,751	2,728	2,549	7.9
Avg annual bill		$72.63	$72.29	$68.57	5.9

Business Statistics . . .

Indexes: 1947–49=100					
FRB Industrial Production	Feb.	144	143	135	6.7
ENR Construction Cost	Mar.	142.8	142.6	135.4	5.5
BLS Cost-of-living	Feb.	114.6	114.6	114.3	0.3
NEMA Sales	Jan.				
Insulation materials		159	160	132	20.5
Electric appliances		105	101	108	−2.9
Wholesale prices	Dec.				
Motors and generators		127.2	127.0	121.8	4.4
Transformers and regulators		129.2	129.2	128.1	0.9
Switchgear and fuses		145.9	145.9	135.3	7.8
GNP—annual rate—$ billion	4th Qtr.	397.3	392.0	367.1	8.2

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